ARCHIVES OF OTOLARYNGOLOGY

VOLUME 26 SEPTEMBER 1937 NUMBER 3

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CRITIQUE OF THE PRESENT TREATMENT OF DEAFNESS DUE TO LESIONS IN THE CONDUCTION MECHANISM

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There is perhaps no more discouraging condition with which otologists have to deal than progressive deafness due to lesions of the sound-conducting mechanism. We are concerned here not with the disturbance in hearing which is present when the ears are discharging or with otosclerosis but rather with that large group of conditions which have hitherto been classified on some bizzarre basis as catarrhal.

PATHOLOGIC CHANGES IN ACUTE INFECTION OF THE MIDDLE EAR

Before we discuss the value of therapy for acute infection of the middle ear, it might be advisable to present the pathologic changes which occur in inflamed or infected ears. First, it seems to us that there is no essential difference between so-called acute catarrhal otitis, suppurative otitis and the fibrous adhesive state. The last-mentioned condition we regard as the end-result or the terminal stage of preexisting inflammation.

While it is well known that fibrosis may follow an acute suppurative process in the ear, it is probable that extensive fibrotic changes may result from repeated minimal insults, none of which is of sufficient virulence to cause appreciable inflammatory reaction.

The pathologic picture in acute infection of the middle ear will naturally vary, depending among other factors on the virulence of the invading organism and the existing anatomic condition. In the mild infections the picture is that of swelling of the mucosa lining the tympanic cavity, with leukocytic infiltration and engorgement of the capillaries in the submucosal tissue.

Read before the Section on Laryngology, Otology and Rhinology at the Eighty-Eighth Annual Session of the American Medical Association, Atlantic City, N. J., June 10, 1937.

With increased activity of the mucosa there results extravasation of exudate in the tympanum. The exudate in the vast majority of instances is absorbed or is drained by way of the eustachian tube, and the inflammatory process subsides in a relatively short time. In the more virulent infections, however, the pathologic changes are more pronounced, and in addition there are ulceration and necrosis of the mucosa, with marked extravasation of purulent exudate (fig. 1). The tympanic membrane naturally partakes in this inflammatory process. With the excessive purulent extravasation and the swelling and necro-

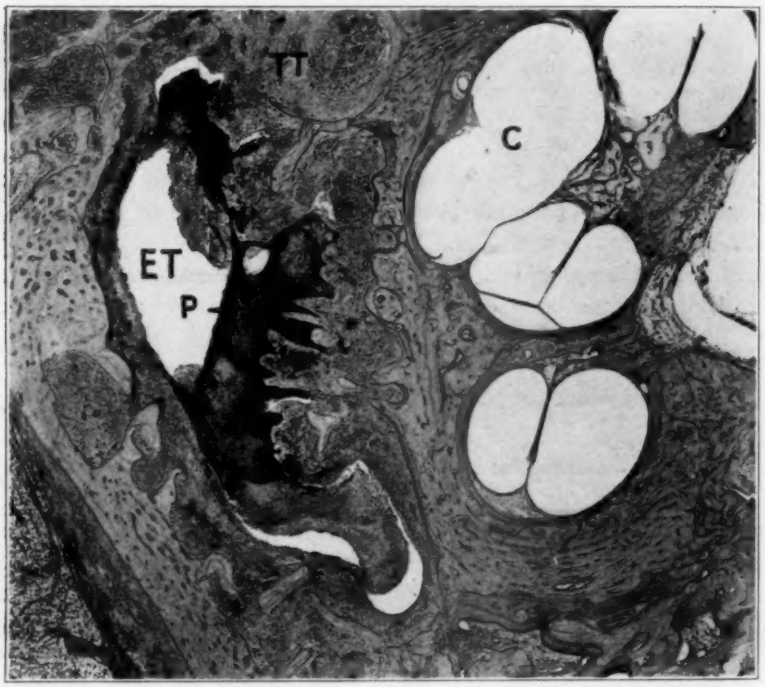

Fig. 1.—Vertical section through the cochlea and the eustachian tube. The mucosa lining the tube shows acute inflammatory changes, with necrosis of the epithelial lining. Purulent exudate is present within.

C represents the cochlea; *E T*, the eustachean tube; *P*, purulent exudate, and *T T*, the tensor tympani muscle.

sis of the mucosa lining the tympanum and the eustachian tube, drainage through the latter channel is impeded. Undue tension on the diseased drum membrane is thus produced until rupture finally takes place.

With regard to the relatively severe infections there is evidence that in the majority of instances restitution takes place in the tympanic cavity without any remains of inflammatory tissue. The purulent exudate is absorbed or drained; the mucosa regenerates and assumes a normal

appearance. The perforation in the drum heals without demonstrable scar formation.

Complete restitution without permanent residual anatomic alterations, however, does not occur in all instances. Sometimes, in severe infections, granulation tissue produced in the process of repair bridges across the tympanic cavity. In the process of healing the granulations gradually shrink and are finally replaced by fibrous scar tissue (fig. 2). These bridges of fibrous tissue, with variations in amount, density and configuration, may remain permanently. As a result of such fibrous adhesions

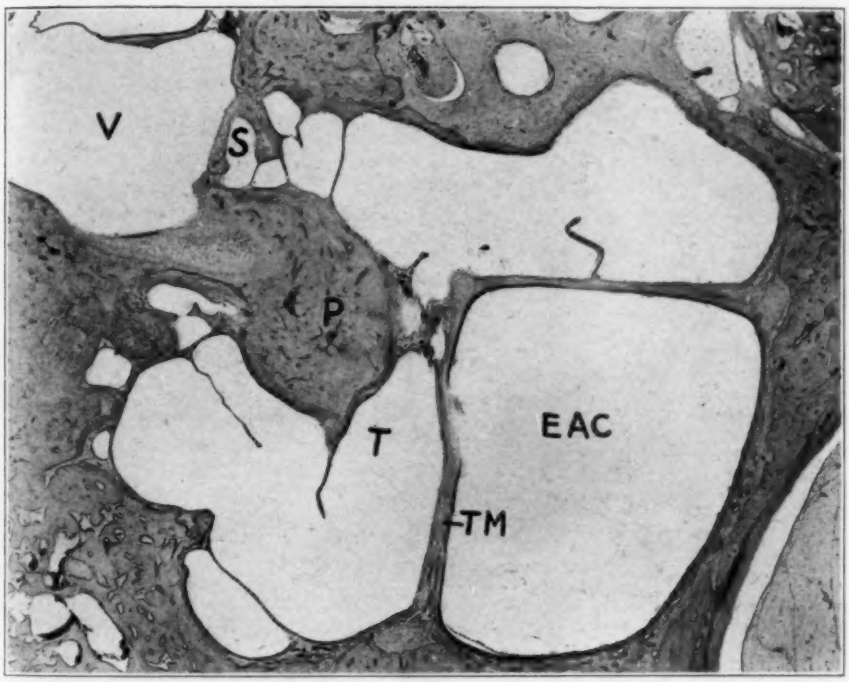

Fig. 2.—Vertical section through the tympanum, which demonstrates marked reaction of the drum and attachment of the latter to the promontory by means of fibrous scar tissue. Thin strands of fibrous scars are also observed about the oval and the round window. *E A C* indicates the external auditory canal; *P*, the promontory; *S*, the stapes; *T*, the tympanum; *T M*, the tympanic membrane, and *V*, the vestibule.

the niche of the round window and the fossa of the oval window may be partially or totally occluded (fig. 3). The tympanic membrane may be drawn toward and adhere to the inner tympanic wall (fig. 2).

In some instances of inflammation of the middle ear, particularly in children, it is observed on histologic examination that considerable swell-

ing and proliferative changes are present in the submucosal tissue of the tympanum with little discharge. The pathologic alterations in the tympanum may be quite as marked as in those instances in which there is excessive discharge. Consequently, the amount of discharge is no criterion as to the pathologic changes, and obviously such changes in the submucosa may occur in instances in which there is no discharge whatever from the middle ear. This may account for the not uncommon finding of scarring in the tympanum without any clinical history of suppuration of the middle ear (fig. 4).

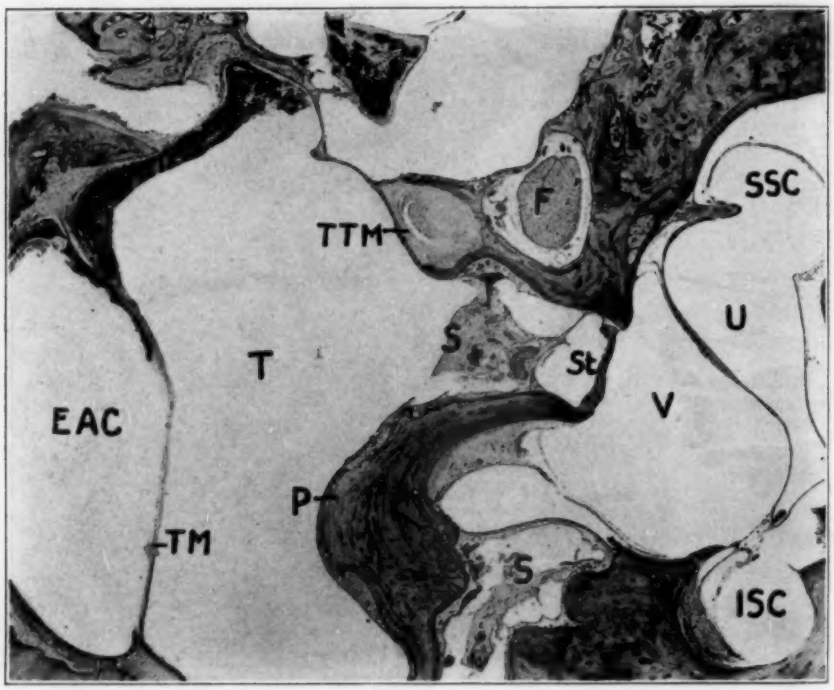

Fig. 3.—Vertical section through the tympanum showing scar tissue in the region of the oval window and in the niche of the round window.

E A C indicates the external auditory canal; *F*, the facial nerve; *I S C*, the inferior semicircular canal; *P*, the promontory; *S*, scar tissue; *St*, the stapes; *S S C*, the superior semicircular canal; *T*, tympanum; *T M*, the tympanic membrane; *T T M*, the tensor tympani muscle; *U*, the utricle, and *V*, the vestibule.

Since the eustachian tube, mastoid antrum and tympanum are in reality one cavity, the inflammatory changes described for the tympanum also occur in the other two structures.

The anatomic state of the tympanic cavity is also an important factor in the end-results of the process of repair. This holds true particularly

for the lining mucosa. In infants and children with a hyperplastic mucosa an infection will bring about even greater swelling of the tissues and consequently will favor agglutination of the surfaces and eventual bridging and scar formation.

PRESENCE OF EMBRYONIC TISSUE IN THE TYMPANUM

In the category of the anatomic state should be included the presence of embryonic tissue in the tympanum. As is well known, in the

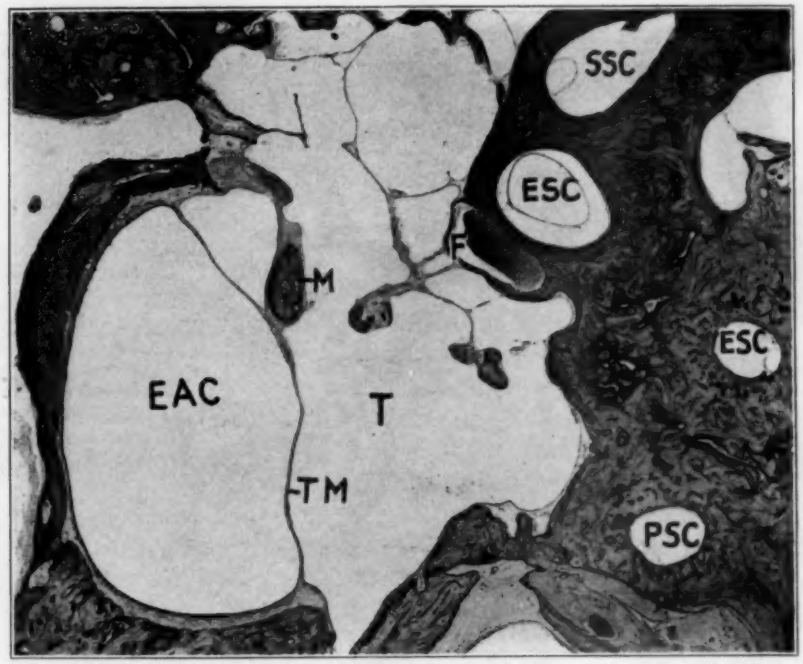

Fig. 4.—Vertical section through the tympanum showing weblike fibrous scars traversing the cavity.

E A C indicates the external auditory canal; *E S C*, the external semicircular canal, *F*, the facial nerve; *M*, the malleus; *S S C*, the superior semicircular canal; *P S C*, the posterior semicircular canal; *T*, tympanum, and *T M*, the tympanic membrane.

fetus the tympanic cavity is occupied by loose areolar tissue, which gradually recedes during life until the normal mucosal lining is formed. This embryonic tissue not only acts as a fertile soil for infection but interferes with the accessibility and aeration of the tympanum. From this embryonic tissue, even in the absence of any infectious process, there is a tendency to the formation of fibrous scars.

Remnants of embryonic tissue are occasionally found histologically in the tympanum throughout life, the most prevalent sites being the region of the attic in Prussak's space (fig. 5) and about the round window. In addition, fibrous bands are at times observed by histologic examination. While their origin is questionable, they are believed to be the remains of embryonic tissue or healed stages of previous inflammation. With regard to the latter, it is significant that a clinical history of previous otitis is not always obtained. These findings are in accord with those of Polvogt.

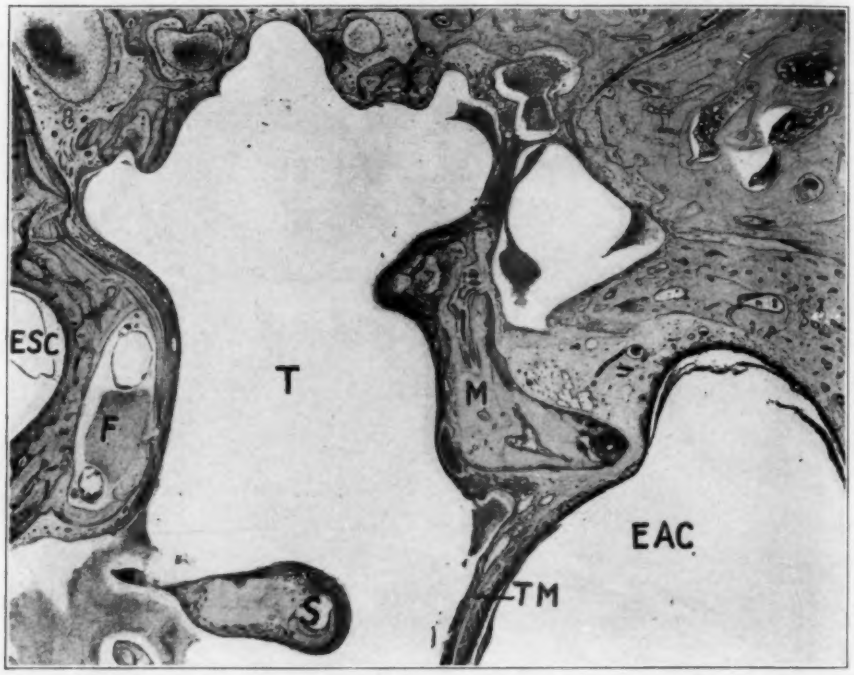

Fig. 5.—Vertical section through the tympanum showing markedly thickened mucosa of Shrapnell's membrane secondary to infection. It is at this site that the remains of embryonic tissue are occasionally observed.

E A C represents the external auditory canal; *E S C*, the external semicircular canal; *F*, the facial nerve; *M*, malleus; *S*, stapes; *T*, tympanum, and *T M*, the tympanic membrane.

HISTORICAL REFERENCES

Since the vast majority of inflammations of the middle ear are transmitted by way of the eustachian tube, and since the latter structure partakes in this inflammatory process, it is only natural that in the therapy of deafness attention was directed to the eustachian tube. As far back as 1880 pioneers in otology were aware of this fact and insti-

tuted therapeutic procedures, some of which are still practiced. Of these, the most popular was tubal inflation with air. This was followed in 1894 by the Seiss modification, whereby injection of menthol vapor and oils into the lumen of the tube was made. In 1894 Denker practiced the instillation of ether, chloroform and ethyl iodine. The use of bougies for the dilation of the tube was later instituted.

Alexander advocated the use of tubal inflation after attacks of acute suppuration of the middle ear or acute mastoiditis have subsided but prior to the onset of scar formation. While from the theoretical standpoint this appears logical, practically it is not usually applicable for the following reasons: In the first place, the exact time of onset of scar formation cannot be determined clinically. The time naturally varies with the individual case. Secondly, in infants or in young children, in whom otitic infections are most prevalent, tubal inflations are difficult.

Whatever other means of infection of the ear there may be, extension through the eustachian tube is unquestionably the most frequent. It is possible that in the invasions of the blood stream by the exanthems the temporal bone may be the site of a metastatic lesion; nevertheless, the sequence of events following acute sinusitis, infections of the upper respiratory tract, improper use of nasal irrigation, diving, etc., with violent blowing of the nose followed immediately by fulness and subsequently pain, fever and aural discharge, is too common not to be definitely significant.

We feel that the histologic picture of chronic proliferative otitis not only occurs as a sequence of a major (suppurative) insult to the ear but may be due to repeated minimal insults. We believe, further, that these minimal insults can be induced by repeated catheterization and bougienage. It is not conceivable that an open beak catheter can be passed through the nose and rotated into the orifice of the eustachian tube without at times picking up small pieces of foreign matter in the nature of mucus. With a blast of air, no matter how it is administered, these particles of mucus are unquestionably projected into the eustachian tube and so into the middle ear. If these particles contain virulent organisms in sufficient number, definite inflammatory signs in the ear follow. If, on the other hand, the particles act merely as foreign matter, they can induce a type of reaction which we call proliferative otitis.

TREATMENT

In discussing the treatment of chronic progressive deafness we have concerned ourselves solely with the use of the eustachian catheter. We believe that by the persistent use of the eustachian catheter the fibrotic changes which we find in some cases of chronic progressive deafness

can be induced or enhanced. We have therefore abandoned this treatment. It is obvious that when bridges of scar tissue have formed across the tympanum they cannot be eradicated by inflation of the eustachian tube or by any other procedure practiced at the present time (fig. 6). We regret the necessity for this iconoclastic attitude, particularly in view of the fact that we have nothing to offer as a constructive substitute; but it is obvious that the futility, and even harmfulness, of repeated catheterization of the eustachian tube in these cases should

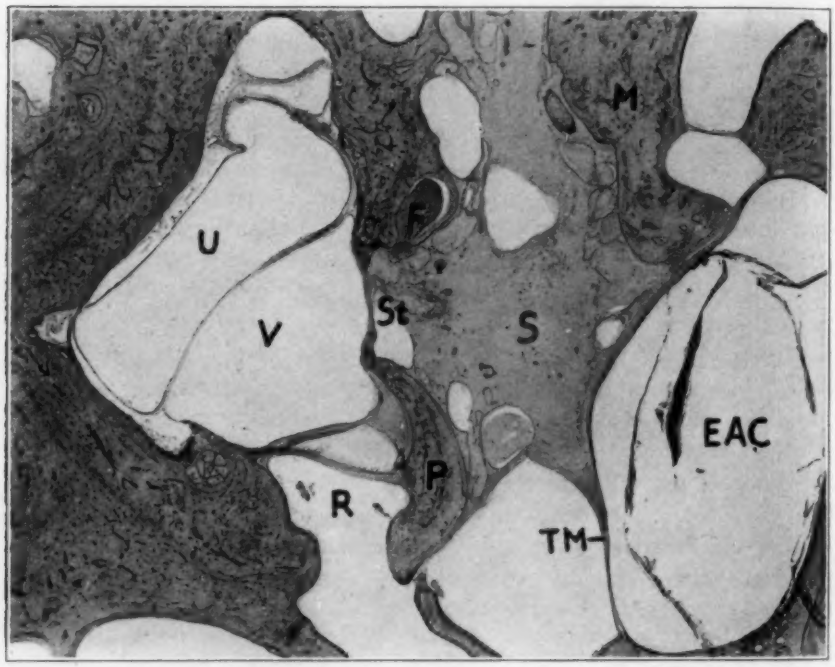

Fig. 6.—Vertical section through the tympanum showing marked scarring within the cavity. This scarring involves the fossa of the oval window and bridges the tympanic membrane with the promontory. The tympanic membrane is retracted as a result of this process.

E A C represents the external auditory canal; *F*, the facial nerve; *P*, the promontory; *M*, malleus; *R*, the niche of the round window; *S*, scar tissue; *St*, the foot plate of the stapes; *T M*, tympanic membrane; *U*, utricle, and *V*, the vestibule.

be publicized to the end that efforts be made along entirely different lines in an attempt to ameliorate this condition.

Clinically, we can offer no indubitable proof of our contention. On the other hand, it is well known that conduction deafness in professional swimmers is a common condition. We have observed this several times

without any history of antecedent inflammation of the middle ear. In these instances the repeated projection of foreign matter (water, mucus, etc.) into the ears must be considered responsible for the fibrotic changes and for the loss of hearing.

Though we have nothing to offer as a constructive substitute in therapy, we wish to emphasize preventive measures. Not only during an acute infection of the upper respiratory tract but at all times, violent blowing of the nose is a vicious habit which endangers the ears. There is no scientific basis for the belief that harm to the ears can be avoided by blowing through one nostril at a time. Furthermore, the importance of careful instruction as to the use of a nasal douche cannot be too strongly stressed. For inflammation of the ear, as for so many other diseases, otologists must rely on preventive measures.

ABSTRACT OF DISCUSSION

Dr. Edward H. Campbell, Philadelphia: Dr. Friesner has presented a subject which constantly engages the attention of every otolaryngologist. He does well to review in detail the pathologic picture of this condition, for in these pathologic changes and their sequelae lies the etiology of progressive deafness due to lesions of the conduction mechanism. It is apparent that there is a wide misunderstanding of the pathologic process, as is reflected in the various odd forms of treatment that have been advanced. As has been suggested by Dr. Friesner, it seems important to abandon many of these therapeutic procedures that appear to do harm rather than good and to seek more potent remedies that may have a beneficial effect on a condition of such economic importance.

The author has emphasized the fibrotic changes in the middle ear and the tympanic membrane that result from an inflammatory process. Such changes are at times extremely marked, leaving the drum thickened and retracted with large, healed or unhealed perforations. All otologists have observed, however, that a much distorted and disfigured drum is often consistent with practically normal hearing, while frequently a much more normal-appearing tympanic membrane is present when the hearing is considerably reduced. This suggests that pathologic changes in the drum itself may be of little importance, while the changes that occur in the middle ear and the eustachian tube are the important factors in the causation of the deafness. The fibrotic and adhesive changes that may interfere with the conduction of sound along the ossicular chain or with the transmission of impulses through the foot-plate of the stapes are no doubt of importance, but it seems to me that similar changes in the eustachian tube that decrease or prevent proper aeration of the tympanum more frequently contribute to the impairment of hearing. On inflation of an ear through the eustachian catheter with the auscultation tube in place, I have often observed that in the deaf ear the air does not enter the middle ear well, but has a squeaky or whistling sound, as if the lumen of the eustachian tube was partly closed by fibrous bands or adhesions. In such cases there is some hope of improvement from inflation and dilation. On the other hand, in cases in which the air enters the middle ear normally the deafness is unimproved and perhaps, as Dr. Friesner has said, is made worse by repeated inflation.

In cases in which there is partial obstruction of the eustachian tube, the obvious treatment would be an attempt at dilation by bougies. However, this type

of treatment has not been universally successful, and it is my impression that its popularity is on the wane, and to my mind rightly so, for such treatment may easily make the condition worse. It is extremely difficult or impossible to pass a bougie through a constricted eustachian tube without traumatizing the delicate mucous membrane, and the healing reaction following such trauma would tend to cause further fibrotic changes in the tube that may still further decrease the size of its lumen. I believe, however, that such cases are the ones in which some improvement in the hearing may be obtained by persistent inflation which can gradually open a eustachian tube the walls of which are in firm contact but are not bound by fibrous adhesions.

While the treatment of chronic progressive deafness is extremely unsatisfactory, I believe with the essayist that preventive measures can do much in lessening the incidence and that prompt and proper treatment of the inflammatory condition responsible for the pathologic changes can lessen to a considerable extent the degree of deafness that may result.

Dr. John Randolph Page, New York: Considering the nooks and crannies of the middle ear that favor the retention of exudate and the formation of inflammatory adhesions, I wonder that hearing is not more greatly impaired than it is after even a mild inflammation in the tympanum. That so many persons recover with a gratifying return of function is probably due in a large measure to the protective action of the ciliated epithelium that lines the tympanum and the eustachian tube and to the anatomic arrangement of the cavities in the majority of persons, which favors drainage and ventilation through the eustachian tube. Dr. Friesner does well to call attention to the bad effect on hearing of the mild but repeated attacks of tubotympanic inflammation with negative pressure and more or less exudate in the tympanum. Since this condition occurs without fever or pain, little attention is paid to it, and while in many cases it resolves spontaneously, I believe the hearing is better preserved in most cases when the drums are opened by paracentesis for more prompt relief of the negative pressure and congestion and to let out any fluid that may be present.

As to the eustachian catheter, I believe in its use and not its abuse. It has been abused by such high authority of late that it takes some courage to rise to its defense. Some sensitive souls are almost afraid to admit the ownership of one for fear of being accused of taking money under false pretenses. To the repeated use of the catheter in cases in which it obviously gives no relief or benefit, I am strongly opposed, but I think Dr. Friesner overestimates the probability of infection of the middle ear from its use. I have not noticed and I am not convinced of the insidiously harmful effect he thinks may occur as a result of inflation in cases of chronic catarrhal deafness of the middle ear. On the contrary, I think that when the middle ear is not being ventilated naturally the negative pressure and congestion within it are relieved and the hearing is benefited by inflation. To the use of bougies and solutions that interfere with or destroy the function of the ciliated epithelial lining of the tube and tympanum I am opposed, as I am to the use of solutions and nostrums that interfere with the important protective function of the ciliated membrane in the nose and nasopharynx. But for the subacute conditions, in which the relief afforded is immediate and often lasting, and for many of the chronic conditions, in which definite though temporary relief is afforded, I shall continue its use, for I know of nothing better to use in place of it. That patients of long experience with many kinds of treatment from many different hands continue to come from time to time when their heads are heavy and their ears full to have their eustachian tubes inflated is evidence enough in favor of its use.

A fair method to pursue for patients with chronic involvement who gain temporary relief from forced ventilation of the middle ears through the use of a eustachian catheter is to tell them to return for treatment when they feel the need of it, if they think the relief afforded by it is worth while. No small number will return to gain the relief it affords, and several have told me of their disappointment when they found themselves in the hands of a specialist who did not give them that treatment and afford them the temporary relief they had been accustomed to receive from it. This again is evidence to me of the usefulness of the eustachian catheter.

For the pathetically hopeful creatures who appeal for help one is incapable of giving and whose hopes one cannot blast too ruthlessly, I know of no more satisfactory placebo to use for a time until one can prepare them for a course in lip-reading and enrolment in a league for the hard of hearing.

The time may come when fibrotic changes in the middle ear and occluded tubes due to swollen lymphoid tissue can be made to respond favorably to roentgen treatment, as keloids and certain cutaneous lesions do, and when medicinal therapy and diet will be developed which will prove more efficacious than those used in the past, but until such things come to pass, I do not think the many persons with chronic catarrhal otitis media who continue to wish to have their eustachian tubes inflated and their middle ears ventilated for the relief these measures afford them should be denied the satisfaction they get from the now almost disreputable eustachian catheter.

Dr. Isidore Friesner, New York: I wish to thank Dr. Campbell and Dr. Page for discussing the paper so freely. Judging from the applause, catheterization is more popular than noncatheterization.

I do not question Dr. Page's statement that there are patients who are relieved by catheterization. I have not met them, or I have met so few that the number is insignificant. On the other hand, there have come to me a great many patients with the statement that they have been treated by Dr. A, B or C by repeated catheterization three times a week and that their hearing has grown continuously worse.

I spend much more time with patients suffering from deafness due to lesions of the sound conduction mechanism than I do with patients suffering from any other condition, for this reason: In the first place, I feel that catheterization is a treatment that I can offer to few persons, and secondly, I feel that it is important to teach these persons how to live. It is important that the patient should remain free from infections, even minor colds. When he goes through a day with a great many hearing contacts, he is much more tired than the person with normal hearing, and when he is tired, he does not hear well. Obviously, there cannot be any change in the ears. Hearing, however, is a complex thing, in which the impulse from the ear is one part and what takes place in the brain is another important part; and when the patient is tired he cannot make the excessive mental effort that he has to make to hear.

A great many of these patients who have told me that in the beginning they were under the impression that they were better as a result of catheterizations have been asked: "Just what do you feel?" A large number, enough to be suggestive, have answered as follows: "After the treatment, I feel very free. My ears feel open and my head feels open;" that is cocaine.

After I obtained this information, a number of patients, all of whom were being catheterized regularly, were treated without the preliminary use of the anesthetic in the nose, and I did not find any whose hearing improved.

Of course, there is little that the otologists can do, but I believe that it would be better to do nothing than to do harm.

THE ETHMOSPHENOFRONTAL OPERATION

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This paper is written in answer to a number of requests which have been made for a detailed description of the technic for ethmosphenofrontal operation. On previous occasions I have discussed various aspects of this operation. In 1922 Dr. Robin Harris and I [1] discussed "Gross and Microscopic Pathology in Twenty-Three Consecutive External Ethmo-Sphenoid Operations;" in 1927 Dr. Sam H. Sanders and I [2] described "Interesting Observations in More Than One Hundred External Ethmo-Frontal Operations;" in 1930 I [3] presented a moving picture of the procedure, and in 1935 I [4] published a paper entitled "The Indications for the External Ethmo-Spheno-Frontal Sinus Operation." At no time, however, has an illustrated description of the entire procedure been placed in print by myself or my associates.

The procedure is that of Jansen,[5] Knapp [6] and Lynch,[7] with some modifications which have gradually been made.

The indications for this procedure are different, depending on whether the condition is acute or chronic. The technic has to be varied somewhat with the two types of infection.

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The illustrations for this article were supplied by Dr. Harry C. Schmeisser and Dr. Joseph L. Scianni, Director and Artist, respectively, of the Pathological Institute of the University of Tennessee.

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For acute sinusitis only drainage is indicated, no complete surgical procedure being carried out under any condition at the primary operation. The preliminary preparation, anesthesia, incision, elevation of the periosteum and primary opening in the bone are carried out in the same way in both types of infection. In a case of the acute type only a fair-sized opening in the bony floor of the frontal sinus and the ethmo-orbital wall is made, giving ample space for drainage tubes to be placed into the frontal sinus through the external wound and also through the external wound through the ethmoid sinus into the nose. No sutures are necessary for closing the wound. After the drainage tubes are removed, which is usually done in a few days, the wound will close with little scar formation.

After acute sinusitis when external drainage has been provided, ample time for complete subsidence of acute symptoms should be given before any complete surgical operation is attempted. From six weeks to two months is a short enough time, and not from one to three weeks, as suggested by some authors. If one attempts complete surgical intervention for acute sinusitis, complications, such as osteomyelitis and meningitis, may be encountered. After drainage has been arranged, if further operative measures are considered, they should not be carried out until all acute symptoms have subsided and the condition has become quiescent, as it was before the acute exacerbation. If an old chronic condition was not present before the acute exacerbation, there is unlikely to be any indication for further surgical treatment after the drainage.

PREOPERATIVE ANALGESIA

The preoperative administration of a hypodermic injection of morphine and scopolamine in varying doses, depending on the size, age and mental state of the patient, is considered important. Patients below the age of 18 and above 50 must be considered individually as some can tolerate morphine better than others. The weight of the patient must be considered. It has been found that an obese patient of a hypothyroid type cannot tolerate either drug as well as a more active energetic person. The easily excited person is susceptible to scopolamine but reacts nicely to small doses combined with larger doses of morphine. The patient who fears the operative procedure tolerates both drugs well—probably because fear is only a temporary state of excitement. A mixture of hyoscine, morphine and cactin is given, one tablet an hour and one-half before the operation is to begin and another one-half hour before. Usually, one-half hour before the operation ¼ grain (0.016 Gm.) of morphine sulfate is also given. Frequently, it is not necessary to administer this last dose. The average patient becomes sleepy and unconcerned and often describes himself as being drunk. There has been practically no complaint of pain during the operation; yet the

cough reflex is not abolished, and the patient can expectorate any blood that may enter the throat. The respiratory rate is diminished, but it can be raised when desired by arousing the patient or engaging him in conversation. Physicians have often been cautioned to beware of scopolamine idiosyncrasies, but I have had only satisfactory results. In administering this form of analgesia one should see the patient before the last injection is given and increase or decrease the dose of either drug if necessary, according to indications.

I shall now describe the usual technic followed in the complete external ethmosphenofrontal sinus operation.

Fig. 1.—The draping of the patient and the incision. (The continuous black line is the incision in the skin, and the two black dots at each end of the black line show the extension of the incision in the soft parts.)

TECHNIC

Preparation of the Skin.—The skin of the entire face and neck should be thoroughly cleansed. Ether or petroleum benzine is satisfactory for this procedure. After the cleansing of the skin, this entire area should have an application of some antiseptic solution, such as merthiolate or iodine.

Draping of the Patient.—The usual covering of the body is done, of course, and the entire head and face are covered except the frontal region, the external portion of the nose and the anterior nares. It has been found that the patient is much more quiet if the nose is left entirely uncovered.

Nasal Packing.—The nose is packed with strips of cotton saturated with a solution of equal parts of a 4 per cent solution of cocaine hydrochloride and a 1:1,000 solution of epinephrine hydrochloride. The

packing is allowed to remain in the nose until the ethmoid sinuses are opened.

Local Anesthesia.—One or two cubic centimeters of procaine hydrochloride is injected into the region where the incision is to be made and also into the deeper soft parts. Injections may be made during the operation if indicated. A large quantity distorts the parts and is not necessary. Narrow strips of gauze saturated in a 4 per cent solution of cocaine and an equal part of a 1:1,000 solution of epinephrine are packed in the wound to prevent bleeding or to anesthetize the tissue when either is desired. The region of the lacrimal sac is sensitive and free use of anesthesia is necessary. I have not seen any toxic effects from cocaine when it was combined with epinephrine. This procedure is carried out at any time during the operation when necessary.

General Anesthesia.—Much more bleeding occurs under general anesthesia. The patient is unable to cooperate with the operator, and many other disadvantages have been encountered in the use of general anesthesia as compared with local anesthesia.

The Incision in the Skin and the Soft Parts.—The incision is most easily described with reference to the internal canthus of the eye. The skin is fixed with a finger of the left hand. An incision is made along an imaginary line half the distance between the inner canthus of the eye and the bridge of the nose, beginning about on a level with the inner canthus of the eye, extending upward and curving with the orbital wall below the brow. The length of the primary incision depends on the size of the frontal sinus, but it should not extend beyond the supra-orbital notch, as the mucous membrane can often be removed from the frontal sinus without cutting the supra-orbital vessel and nerve. In the average-sized frontal sinus the incision is only ⅜ to ⅝ inch (0.9 to 1.5 cm.) in length. Because of its looseness and mobility in this region, the skin can be retracted and the incision extended through the underlying tissues. A large exposure is obtained when only a small incision is made in the skin. If later during the operation it is thought best to extend the incision, it can be done at any time.

Retraction Sutures.—Four or five retraction sutures may be used in the skin and the soft tissues. The results are well worth the time taken in insertion. No deep sutures are used. Usually, 2 sets of sutures laterally and 1 above are used.

Hemostasis.—After the insertion of the retraction sutures, a piece of gauze wet in a solution of cocaine and epinephrine is packed into the wound to stop the bleeding. Usually no vessels are tied. Formerly hemostasis was prolonged by ligating these small vessels with catgut. It has been found, however, that cocaine and epinephrine will accomplish this practically as well, and when persistent bleeding does occur, the

vessels can be clamped with a hemostat, a dry field being obtained with few or no ligatures.

Elevation of the Periosteum.—The periosteum is elevated only inferiorly and externally from the line of incision—never upward. A medium-sized Alexander gouge is a satisfactory instrument to use for the beginning of the elevation—that is, from the ascending process of the superior maxilla and the lacrimal bone—while a better instrument to use for the elevation of the periosteum from the lamina papyracea and the roof of the orbit is the Freer sharp elevator or a similar instru-

Fig. 2.—The incision in the skin. The insert shows the five retraction sutures in place, the metal retractor in position, the periosteum being picked up with the forceps (the periosteum is accentuated) and the attachment of the superoblique muscle being cut from the bone.

ment. About the upper third of the lacrimal sac is elevated outward and downward and is retracted with the other soft tissues. The attachment of the superior oblique muscle is probably best removed with a knife, the attachment being cut or scraped away from the bone. During the elevation and throughout the remainder of the operation some form of retraction should be used. I have tried all the mechanical self-retaining retractors and also the more simple ones, but I now use only a simple tin retractor, which is held either by the operator or by the assistant. It seems to me that the latter type is much safer, gives a better view and is the least cumbersome and the most satisfactory of all retractors.

Tying of the Anterior Ethmoid Vessels.—Sewall [8] first described the procedure of tying the anterior ethmoid vessels. This is easily done with any slightly curved suture carrier. This procedure makes the technic of operation on the ethmoid and frontal sinuses almost bloodless, especially if there is frequent application of epinephrine and a 4 per cent solution of cocaine hydrochloride. During the early part of the operation, if the operator will only take sufficient time for the cocaine and epinephrine to have the desired effect, much time will be saved, as the field will be free from blood and anesthesia will be more satisfactory. Instead of using a ligature, Kistner [9] coagulates these vessels as well as the sphenopalatine arteries.

Opening of the Bone of the Ethmoid and Frontal Sinuses.—A medium-sized Alexander gouge is placed in a vertical position at the junction of the ascending process of the superior maxillary bone and the internal angular process, and usually, if a large mass of bone is

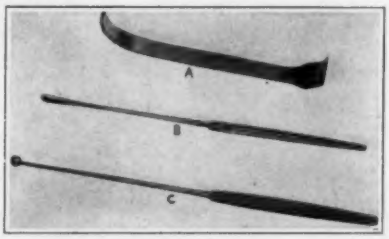

Fig. 3.—*A* indicates the metal retractor; *B*, a long elevator for instrumental manipulation of the posterior ethmoid and sphenoid sinuses, and *C*, a curet with an extra long handle for exenteration of the sphenoid sinus.

removed, both the frontal sinus and the anterior ethmoid sinus are opened. The entire floor of the frontal sinus and any superior orbital ethmoid sinuses are removed.

Exenteration of the Frontal Sinus.—The entire lining of mucous membrane and any other pathologic tissue in the frontal sinus are now removed. Usually dry gauze facilitates separation of the mucous membrane from the bone, and sometimes, especially if the mucous membrane is fibrous, it may be removed in toto. The use of mirrors for viewing all parts of the frontal sinus shows when removal of all mucous membrane has been accomplished. It seems to me that the use of the mirror as an aid in the exenteration of the frontal sinuses is one of the most important steps in the whole procedure. Without the mirror it would be impossible for me to exenterate the cavity with this described technic.

8. Sewall, E. C.: External Operation on the Ethmosphenoid-Frontal Group of Sinuses Under Local Anesthesia, Arch. Otolaryng. **3**:377-411 (April) 1926.

9. Kistner, Frank B.: Personal communication to the author.

So far as I know, the use of the mirror for this procedure was first described by Dr. Sam H. Sanders and myself,[2] in 1931.

The radical operation on the frontal sinus as described by Howarth,[10] is sometimes said to be similar to the Lynch operation, but to me there is nothing similar except the opening in the bone, as Howarth does not remove the mucous membrane of the frontal sinus. The same can also be said of all those operations in which only a part of the

Fig. 4.—The bony exposure of the right frontal sinus including the upper half of the lacrimal fossa. The anterior ethmoid vessel has been ligated. The Alexander gouge is in position for opening the frontal and ethmoid sinuses. The insert shows the frontal sinus and ethmoid cells opened and the much thickened mucous membrane of the frontal sinus protruding from the cavity.

mucous membrane is removed. It seems to me that the most important step in this operation is the removal of the entire mucous membrane of the frontal sinus including the region of the nasofrontal duct as well as all the mucous membrane of the ethmoid sinuses.

10. Howarth, W. G.: The Radical Frontal Sinus Operation, J. Laryng. & Otol. **36**:417 (Sept.) 1921.

Exenteration of the Ethmoid Cells.—A large portion of the wall between the ethmoid sinus and the orbit is removed. If the frontal sinus is very large, more of the ethmo-orbital wall is left intact to prevent retraction of the orbital contents. The ethmoid sinuses are completely exenterated under direct vision, only the middle turbinate being left entirely intact. In doing the external exenteration it is easy to see how impossible it is to remove all the ethmoid cells by the intra-

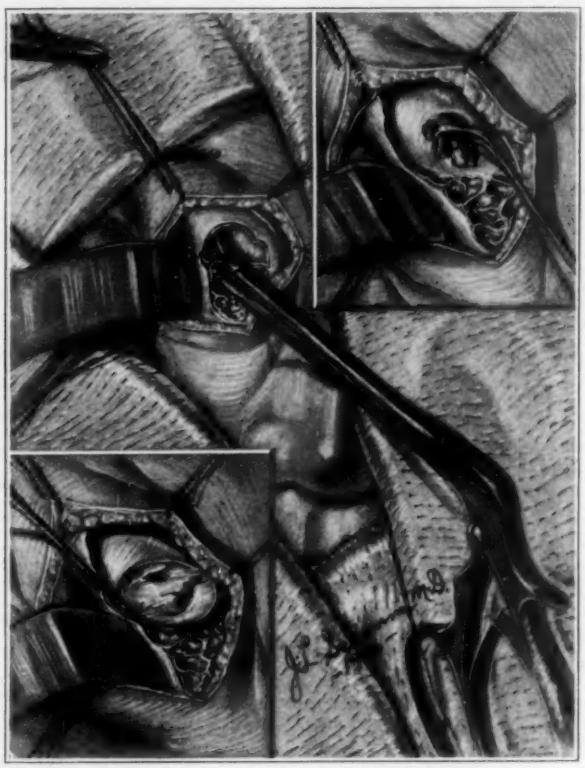

Fig. 5.—The forceps removing the floor of the right frontal sinus. The male portion of the bite is in the frontal sinus and the female portion is in the ethmoid sinuses.

The right upper insert shows the curet removing diseased mucous membrane from the right frontal sinus.

The left lower insert shows pathologic mucous membrane in the right frontal sinus as seen in the mirror.

nasal route. Almost invariably, one or more unopened cells which had been overlooked at the intranasal operation are uncovered during the external procedure.

Procedure for Sphenoidectomy.—The entire bony wall between the ethmoid area and the sphenoid sinus is removed. The first step in this procedure is the entrance of the sphenoid sinus with a probe or an elevator. The most satisfactory instrument to me has been a long, thin elevator which I devised several years ago. It is somewhat similar to a Freer elevator, but it has a much longer handle. Practically all sphenoid sinuses may be entered with this instrument. With it the natural opening is enlarged until a small Hajek punch, or, as I am accustomed to

Fig. 6.—A small portion of the exenterated frontal sinus. The posterior ethmoid cells have been partially exenterated. The anterior wall of the sphenoid sinus has been entirely removed and the sphenopalatine artery is being tied in the mucous membrane of the floor of the sphenoid sinus. The middle turbinate is intact in the most inferior and medial portion of the wound.

The right upper insert shows a small portion of the exenterated frontal sinus, the partially exenterated ethmoid cells, the ligated sphenopalatine artery in the mucous membrane of the floor of the sphenoid sinus, the exenterated sphenoid sinus and a portion of the middle turbinate.

The right lower insert shows two catgut sutures in the region of the attachment of the superoblique muscle and the beginning of the insertion of the sutures in the skin.

call it, a Kofler punch, can be used. The entire anterior wall is removed if the sphenoid sinus is diseased. Of course, if it is little diseased or not at all, it is allowed to remain intact. If the mucous membrane is

moderately or badly diseased, it is removed in its entirety with elevators, curets, etc. If the floor is to be partially or mostly removed, the mucous membrane of the nasopharynx under the floor of the sphenoid sinus is elevated and this mucous membrane which contains the sphenopalatine artery is ligated according to the method of Sewall.[8] The ligation is done with the same thread-carrying needle used for the vessels of the ethmoid sinuses. The floor is now removed with a strong biting forceps. If the nose is narrow and one rather expects difficulty in obtaining a good opening into the sphenoid area, the septum between the sphenoid sinuses should be removed, with exenteration of both cavities. Sewall [11] has described a satisfactory method of handling this problem by doing a submucous resection of the posterior part of the septum, removing the rostrum and the septum of the sphenoid bone and the floor of both cavities.

The frontal, sphenoid and ethmoid sinuses are now packed with narrow strips of iodoform gauze, the wall of the middle turbinate being packed well over toward the septum of the nose.

Suturing the Wound.—Two small catgut sutures are inserted through the attachment of the superior oblique muscle, replacing it as nearly as possible at its former position. Many times this procedure is not carried out, and the result seems to be the same as when it is done. The wound is closed with a special silk suture [11a] or dermal or horse hair sutures. The sutures are removed from the skin in twenty-four hours. No flaps of mucous membrane or skin are used. I have not tried the skin grafts as suggested by Ferris Smith,[12] but I have used grafts of mucous membrane from the septum without benefit. Likewise grafts of mucous membrane from the lateral nasal wall and from the middle turbinate have not proved satisfactory in my hands. Instead of trying to preserve the nasofrontal mucous membrane or to promote drainage by means of skin grafts of any kind in this region, I expend all my efforts in removing the mucous membrane of the frontal and ethmoid sinuses. I have the impression that if a patient who has undergone operation on the ethmoid and frontal sinuses can go through the fourth month of the postoperative period without acute rhinitis, influenza or some other complication, the frontal sinus will not become infected from that time on and will not need a graft of mucous membrane or skin, nor will he need a nasofrontal duct to promote drainage.

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11. Sewall, E. C.: The Operative Treatment of the Nasal Sinus Disease, Tr. Am. Laryng., Rhin. & Otol. Soc. **41**:553-562, 1935.

11a. DeKnatel Sutures—Sutures made of DeKnatel silk, said to be moisture and serum proof surgical silk, nonoxidizing and of extra tensile strength. They are supplied by J. A. DeKnatel and Son, Inc., Queens Village, N. Y.

12. Smith, Ferris: Additions to the Complete Operation on the Fronto-Ethmosphenoid, Arch. Otolaryng. **22**:184-185 (Aug.) 1935.

Within the last few weeks, in discussing the technic of the external ethmofrontal operation with Dr. Frank B. Kistner,[9] I found that he is so enthusiastic about the use of the Sewall flap[11] of the lateral wall of the nose and the middle turbinate that I have again decided to try their use in this procedure. At the time of writing I have made use of the flap of the lateral wall in two cases, but sufficient time has not elapsed for me to form any opinion as to its value. As I have described, I have preserved the middle turbinate intact when possible.

It has been my custom to leave the external dressing off after twenty-four hours, except for an overhanging flap which protects the wound but still allows exposure to light and air. For the last few months, however, this procedure has been changed and a small external dressing has been used. This dressing absorbs tears which might soften the line of incision and reduces the possibility of a superficial infection which sometimes arises. This is a slight change, but I believe it is worth mentioning. Ordinarily, the gauze covering is worn three or four days. If one is careful of the wound, causing as little trauma as possible at the time of the operation, there will be little swelling of the wound. The intranasal packing is removed in three or four days, and little further treatment is indicated. The nose is sprayed with a weak solution of cocaine hydrochloride, and suction is used to remove blood clots, dried secretion, etc.

Formerly an attempt was made to keep the region of the nasofrontal duct open with probes and by other means, but I am convinced that the best procedure is to keep all instruments out of the frontal sinus in the usual case. Occasionally, the passage of a separator between the middle turbinate and the lateral wall might be carried out to break up any possible adhesion. This is especially important anteriorly. The same procedure may be necessary about the junction of the posterior ethmoid and sphenoid sinuses.

COMPLICATIONS AND SEQUELAE

Osteomyelitis.—In my series of cases osteomyelitis and abscess of the brain have been encountered once. If one is careful in selecting patients, this should rarely occur. It seems to me that if acute exacerbation is present, a complete external operation is practically never indicated. Only drainage should be instituted in such a condition. Progressive osteomyelitis after an external operation on the frontal and ethmoid sinuses will be rare if all tissues are handled with the least possible trauma, strict attention being paid to the anatomic landmarks, and a complete operation being done only when the process is in a quiescent stage.

Diplopia.—A high percentage of patients have no diplopia, a moderate number have diplopia for a few days and a small percentage have

rather annoying diplopia for several weeks. I have not observed permanent diplopia in any case, but I had one patient who was not entirely relieved of the symptoms for nearly a year. I have not been able to decide just what caused the condition, as all patients are treated alike and it has no connection with any other complication.

Meningitis.—It has been my good fortune not to see meningitis associated with operation in any case in which I have been the surgeon. In a few cases the dura has been uncovered slightly, but at no time have I observed any symptoms arising from this condition. It seems to me that operating in a quiescent period is the important precaution which makes for safety.

Deformity.—In the usual case there should be little if any deformity. If the sutures are properly placed and are removed early, the line of incision is hardly noticeable. Occasionally, the line of incision takes on an excessive scar formation, or rather a mild keloid, but usually after massage and time the line of incision is scarcely visible. In a small percentage of cases retraction of the orbital contents has been noticed. This condition usually occurs in the large frontal and ethmoid sinuses, but seems to be less if some of the posterior ethmo-orbital wall is allowed to remain intact. Of course, it is understood that none of the anterior wall of the frontal sinus is removed. Implants of fat or fascia lata are rarely indicated.

Anesthesia of the Frontal Region.—If the superior orbital nerve has to be cut or severely bound, numbness of the frontal region results, which is annoying to the patient. In a few weeks, however, it disappears.

Suppuration of the Wound.—Stitch abscesses are seldom seen, as ligation of the bleeding vessels in the soft parts is rarely done. Rarely, the soft tissues in the region of the incision become swollen a few days after the operation owing to infection of the soft tissue or to infection within the frontal and ethmoid cavities, making it necessary to open the line of incision for draining of the soft tissue or of suppuration in the ethmoid and frontal sinuses. This condition rapidly subsides, causing no further trouble and no deformity. No closing suture is necessary.

Recurrence of Infection.—In a small percentage of cases, after a cold or influenza the frontal sinus becomes tender and painful, and occasionally the ethmoid, frontal and ocular regions swell. Usually an ice bag applied to the region, with some attention to the nose intranasally, will cause the condition to subside, but rarely external drainage must be carried out to get the best results. I am fully convinced that practically every time such a condition has arisen, either an ethmoid cell has been overlooked—this is usually in the region of the cribriform plate—or the frontal sinus has not been completely exenterated of its mucous membrane at the primary operation. As one becomes proficient

in removing the entire contents of the frontal and ethmoid sinuses, especially with the aid of the mirror, this complication will seldom be seen.

CONCLUSION

It seems to me that the external ethmosphenofrontal operation should be done only in carefully selected cases but that there are cases in which the disease will respond much better to this procedure than to any intranasal technic and that if enough time is given, with careful attention to detail, the results after the technic described should be gratifying to the patient as well as to the operator.

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ANALYSIS OF RESULTS OF VACCINATION OF COLLEGE STUDENTS AGAINST COLDS

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In years past much experimental work has been done, many surveys made, an infinite number of types of treatment advocated and countless words written about the common cold. In spite of all this, far too little is known about its mechanism and satisfactory methods of treatment. The importance of this disease is tremendous. If the common cold could be eliminated, its complications would all be wiped out. Otitis media, mastoiditis, sinusitis, some types of pneumonia and all the serious sequelae of these complications would no longer be feared by patient or physician. Constitutional diseases secondary to some of the infections of the upper respiratory tract would become as rare as typhoid. Since the common cold accounts for about 70 per cent of all infections of the respiratory tract, the economic effect itself deserves attention. It has been estimated [1] that the total wage loss per annum to industry in the United States due to the common cold amounts to several million dollars.

The prevalence of colds seems to be universal. In 1924 the United States Public Health Service [2] sent questionnaires to 13,000 persons distributed from Massachusetts to California. In all localities colds appeared in epidemic form. A high incidence in October was followed by a fall until late December, when a sharp rise occurred, reaching its peak in January. This finding was confirmed by Smiley,[3] who followed the course of acute infections of the upper respiratory tract over a four year period in 2,485 male college students. He found no immunity in this group: Twenty-three per cent had four or more colds per year, 60 per cent had two or three colds and the remaining 17 per cent had one cold in each twelve month period.

Read at the Fifty-Ninth Annual Congress of the American Laryngological Association, Atlantic City, N. J., June 1, 1937.

From the Department of Otolaryngology and Student Health Service of the University of Pennsylvania.

1. Brundage, D. K.: Importance of Respiratory Diseases as a Cause of Disability Among Industrial Workers, Pub. Health Rep. **43**:603 (March 16) 1928.

2. The Prevalence of the Common Cold, Pub. Health Rep. **39**:2669, 1924.

3. Smiley, D. F.: Acute Infections of the Throat and Respiratory System, J. A. M. A. **82**:540 (Feb. 16) 1924.

Investigations regarding the etiology of the common cold have led to many divergent and different opinions. Certain experimenters publish evidence that a filtrable virus is the causative factor; others produce figures showing bacterial infection to be responsible; still others place most emphasis on environment, particularly variations in temperature and humidity, while a fourth group consider metabolic disorders to be the most important factor. Is it not possible that all may be right in part, yet none right in toto?

The studies of Kruse [4] in 1914 and of Foster [5] in 1916 gave evidence that colds are caused by a filtrable virus. Since that time, Dochez [6] and his co-workers have experimented along these lines, and have definitely established that colds can be produced by a filtrable virus in apes and in human beings and that this substance can be cultivated and grown in a chick embryo medium.

Thomson and Thomson,[7] however, expressed an unwillingness to admit that this explains the origin of all colds. They pointed out that there is considerable evidence to show that ordinary bacteria, such as pneumococci, streptococci, and influenza bacilli may of themselves produce colds. Then, too, it has been shown that swine influenza cannot be caused by a virus alone, but must be accompanied by a certain hemophilic bacillus. In addition, they raised the question of the possibility that certain ordinary bacteria may assume a filter-passing phase.

There seems to be some doubt concerning the influence of climate on the incidence of colds. Some years ago a survey was carried out, covering 900 college students. They were selected from parts of the country climatically different. Surprisingly enough, the proportionate number of colds in Pasadena, Galveston and Chicago was about the same. Another survey covered 5,000 students, selected from areas representing all types of climate found in the United States. Again it was found that the incidence of colds was about the same for the various regions. It was noted, however, that colds unquestionably are most frequent during that period of the year when sudden changes of temperature and humidity are most pronounced. Therefore, it is believed by many that climate itself is not of major importance but that sudden changes of weather can and do exert a profound effect on the occurrence

4. Kruse, W.: München. med. Wchnschr. **61**:1547, 1914.

5. Foster, G. B., Jr.: The Etiology of Common Colds, J. A. M. A. **66**:1180 (April 15) 1916.

6. Dochez, A. R.; Mills, K. C., and Kneeland, Yale, Jr.: J. Exper. Med. **63**:559, 1936. Shibley, G. S.; Mills, K. C., and Dochez, A. R.: Studies on Etiology of the Common Cold, J. A. M. A. **95**:1553 (Nov. 22) 1930.

7. Thomson, D., and Thomson, R.: Ann. Pickett-Thomson Research Lab. **8**:533, 1932.

of colds. The experiments of Kerr [8] lend support to this hypothesis. Kerr placed human subjects in what was termed an ideal environment, i. e., 71 F. and 55 per cent humidity, and exposed them to persons having acute colds. Fresh secretions were placed in the conjunctival sacs, the same drinking glasses were used and exposure to droplet infections by sneezing was carried out, but under such conditions he could not transmit the cold in a single case.

The question of treatment is possibly even more confusing than the factors previously mentioned. Vitamin feeding, sun lamps, roentgen therapy, chlorine inhalations, the use of alkalis, sweat baths, cold baths and vaccines (autogenous, stock and intra-oral) are only a few of the therapeutic and prophylactic measures used or still in use. The results of the use of vaccine as a prophylactic agent are varied. Certain observers have reported large series of cases in which the results of statistical analyses are definitely against the efficacy of the vaccine. In 1921 von Sholly and Park [9] reported on their prophylactic vaccination of 1,536 employees of the Metropolitan Life Insurance Company. They gave a stock vaccine in a series of three doses of 0.5 cc., 1 cc. and 1 cc. They concluded that the vaccination is worthless, because 29.7 per cent of their controls escaped infection, whereas only 13.7 per cent of the inoculated group had this experience. In 1927 Ferguson [10] and his co-workers reported on a series of 138 treated patients, with 148 controls, and concluded that prophylactic vaccination with stock vaccines is useless and agreed with Jordon, Norton and Sharp,[11] who contrasted the conclusions of satisfied patients and controlled statistics.

Many reports of vaccine treatment are, however, much more favorable than those mentioned. Eyre and Lowe [12] in 1918 treated 1,000 New Zealand troops and used 1,000 controls. The incidence of colds in those treated was 1.2 per cent against 7.3 per cent in the untreated.

Given [13] in 1921, using a vaccine supplied by the Royal College of Physicians of Edinburgh on sailors of the British navy, found vaccination beneficial to from 55 to 65 per cent.

Lempriere [14] vaccinated 220 boys in a college of 535 students and found that the noninoculated lost three times as much time from infections of the upper respiratory tract as the treated group. The severity

8. Kerr, W. J.: The Common Cold, J. A. M. A. **107**:323 (Aug. 1) 1936.
9. Park, W. H., and von Sholly, Anna I.: J. Immunol. **6**:103, 1921.
10. Ferguson, F. R.; Davey, A. F. C., and Topley, W. W. C.: J. Hyg. **26**: 98, 1927.
11. Jordon, E. O.; Norton, J. F., and Sharp, W. B.: J. Infect. Dis. **33**:416, 1923.
12. Eyre, J. W. H., and Lowe, C. E.: Lancet **2**:484, 1918.
13. Given, D. H. C.: J. Roy. Nav. M. Serv. **7**:330, 1921.
14. Lempriere, L. R.: J. State Med. **39**:79, 1928.

TABLE 1.—*Data Obtained from Eighty-Six Patients*

Case	Age	Number of Colds per Year Before Vaccination	Average Duration, Days	Total Number of Days per Year Before Vaccination	Number of Colds in Year After Vaccination	Average Duration, Days	Total Number of Days in Year After Vaccination	Result of Vaccination	Physical Defects or Disease Present
1	24	4-6	4	20	1	4	4	Colds less frequent	Mild chronic ethmoiditis
2	21	10	10	100	7	7	49	Only moderate improvement	Allergic; sensitive to dust
3	20	5-6	7	35	1	4	4	Reduction of duration and frequency	Septal deflection, moderate grade
4	19	10	10	100	1	3	3	Marked improvement	None
5	21	3	14	42	1	7	7	Improved	None
6	22	4	6	24	2	3	6	Less severe colds	Chronic pharyngitis
7	25	8	10	80	0	0	0	Complete freedom from colds	None
8	22	4	14-21	56	2	14	28	Very slight improvement	None
9	23	4-6	7-21	35	3	7	21	Less severe and frequent	None
10	23	2-4	20-40	60	1-2	2-4	8	Duration much reduced	Allergic
11	21	10	3-4	40	0	0	0	Complete relief	None
12	21	5	21-28	100	3	1	3	Marked improvement	None
13	21	8-10	7-14	80	0	0	0	Complete relief	Chronic pharyngitis
14	23	10-12	5-10	80	2	3-5	10	Improved over two year period	Left tonsil stump septic
15	22	8-10	10	80	0	0	0	Complete relief	Chronic ethmoiditis
16	22	5	7-10	35	1	5	5	Less frequent and intense	Chronic ethmoiditis
17	22	2-3	7-14	20	2-3	1-2	6	Attacks very mild	Tonsil infection, slight
18	29	3	14	42	1	10	10	Attacks less severe	None
19	22	8-10	10	80	2	7-14	20	Much improved	None
20	27	3-4	14-21	86	1	7	7	Less susceptible	None
21	21	4	10-15	40	3	7	21	Less severe	None
22	24	8	10	80	0	0	0	Complete relief	Slight infection of tonsils
23	22	8-10	4-12	48	3	2-5	15	Less frequent and severe	None
24	26	4	7-14	40	0	0	0	Complete relief	None
25	20	10-12	8	80	2	14	28	Greatly improved	Moderately bad nasal anatomy
26	23	5	10	50	3	6	18	Less frequent and severe	None
27	36	10	30	200	3	14	42	Moderate improvement	Allergic
28	19	5-6	14	60	0	0	0	Complete relief	To have tonsillectomy if not improved
29	28	3	30	90	0	0	0	Complete relief	None
30	23	10-15	3	30	4-5	3	15	Moderate improvement	Chronic suppurative otitis media
31	20	5	6	30	2	6	12	Less severe and frequent	Bad septum; pneumatic turbinate
32	24	8-10	7-10	56	2	7	14	Less severe colds	None
33	19	8-10	10	80	0	0	0	Less colds first year; none second	None
34	24	5	10	50	0	0	0	Complete relief	None
35	25	10	8	80	8	2	16	Moderately improved	None
36	23	10	8	80	1	5	5	Improved	Chronic sinus infection
37	26	2-3	5-8	16	2-3	5-8	16	Colds less severe	Hypertrophic inferior turbinates
38	23	10	8	80	1	14	14	Improved three successive years	None

39	21	4-5	15	60	2	7	14	Improved	None
40	22	6	14	84	0	0	0	Complete relief	Enlarged right middle turbinate
41	21	2-3	30	60	1	14	14	Improved	Septal deflection, moderate
42	25	5	7	35	0	0	0	Complete relief	None
43	19	10	8	80	1	3	3	Improved	None
44	23	4	10	40	2	10	20	Improved	Chronic pharyngitis, if vaccine fails
45	25	5	21	105	3	14	42	Moderate improvement	Septal deflection; should have operation
46	24	5-8	3-7	35	1	2	2	Greatly improved	Slight septal deflection
47	18	7-8	3-5	35	0	0	0	Complete relief	Moderate infection of tonsils
48	39	3-4	21	64	3-4	21	64	Not improved	Suppurative sinus disease
49	37	3-4	28	84	5	28	140	Not improved	None
50	22	3-5	5-9	32	3	5-9	27	Not improved	None
51	21	4	14	56	4	14	56	Not improved	None
52	19	3-4	21	63	3	14	42	Not improved	Chronic infection of right antrum
53	21	3-4	14	42	3	14	42	Not improved	Septal deflection obstructive
54	23	4-5	10	50	4-5	10	50	Not improved	Chronic infection of tonsils
55	22	12	14	140	12	14	140	Not improved	Latent pulmonary tuberculosis
56	23	3-4	7	28	3-4	7	28	Not improved	Should have nasal operation
57	23	10	8	80	10	8	80	Not improved	Advise submucous resection
58	20	10	8	80	10	8	80	Not improved	Allergic
59	20	4	21	80	4	21	80	Not improved	Septal deflection
60	25	4-5	21	80	1	21	21	Moderate improvement	Bad nasal anatomy; pharyngitis
61	23	3-4	7	28	3-4	7	28	Not improved	Clouded maxillary sinuses
62	27	3-4	5	20	3-4	5	20	Not improved	Clouded maxillary sinuses
63	20	8	7	56	1	21	21	Moderate improvement	Hyperplastic ethmoiditis; deflected septum
64	20	8	7	56	1	21	21	Improved	Deflected septum; hyperplastic ethmoids
65	21	15	7	105	1	4	4	Improved	Deflected septum
66	21	2	4	8	1	5	5	Improved	None
67	21	4	5	20	2	7	14	Not improved	Slight sepsis of tonsils
68	22	3	4	12	1	4	4	Not improved	Advise submucous resection
69	20	5	14	60	1	1	10	Improved	Bad septum
70	25	3½	14	72	3	7	21	Moderate improvement	Slight chronic sinus infection
71	18	5	10	50	2	7	14	Improved	None
72	20	8	14	112	1	14	14	Improved	Small adenoid; tonsil remnant
73	20	3	10	30	1	4	4	Improved	None
74	35	2	10	20	2	10	20	Not improved	Bad nasal septum; was told vaccine would probably not help
75	21	10	10	100	0	0	0	Complete relief	Has taken vaccine four years
76	17	5	7	35	2	3	6	Improved	Granular pharyngeal wall
77	26	7	7	49	1	4	4	Improved	Allergic; polyposis; hyperplastic ethmoiditis
78	22	3	8	24	2	6	12	Doubtful	Septal ridge
79	22	4	14	56	2	9	18	Doubtful	Obstructive nasal deflected septum
80	19	12	14	168	2	7	14	Improved	None
81	24	2	14	28	1	7	7	Improved	Chronic infection of tonsils; moderate septal deflection
82	21	8	10	80	2	10	20	Improved	Bad septum; tonsil stumps; infected pharyngeal wall
83	20	10	7	70	0	0	0	Complete relief	Slight septal deflection; tonsil stumps
84	23	3	7	21	0	0	0	Complete relief	Left septal spur, not obstructive
85	23	4	8	32	3	7	21	Not improved	Lymphoid tissue, postpharyngeal wall
86	19	3	20	60	3	4	12	Improved	None

of infection and of complications was noticeably reduced in the treated group. His treated patients, too, included practically all those in the school particularly susceptible to recurrent colds.

Thomson and Thomson [15] after a thorough study of all the available bibliography on vaccination against colds stated:

> We will conclude that in our opinion there is abundance of irrefutable evidence in favor of the value of vaccines in the treatment and prevention of colds. Preventative inoculation against colds gives no guarantee of immunity to catarrh, but it is our experience that colds contracted in inoculated persons are less severe as a rule than those contracted by the non-inoculated, and furthermore, the inoculated are less liable to complications.

The literature is almost endless on this subject, and the references cited represent only a few of the most outstanding studies and opinions. At a glance it is seen that the subject is controversial and by no means settled. The use of oral vaccines commented on favorably by some is still new and is not commented on in this report.

In the student health department of the University of Pennsylvania my associates and I have been confronted with the problem of dealing with a considerable number of cold-susceptible students. In spite of a lack of faith in prophylactic vaccination for this condition on my part, it was decided to give a series of inoculations to those students who wished to give this treatment a trial.

In the past four years 108 students have been so treated. All were examined carefully before treatment, and the status of the nose, throat and sinuses was determined. If major anatomic nasal abnormalities were present, surgical operation was recommended instead of injections. Suppurative conditions of the sinuses were not included, as it was our intention to use the vaccine from the standpoint of prevention rather than of cure. Allergic students were tested and treated accordingly. If infections were liable to recur, the patient was admitted to the group. Persons with borderline anatomic nasal defects and persons with chronic but inactive sinus disease likewise were accepted. A stock vaccine containing the following organisms was used:

> Staphylococcus aureus and Staphylococcus albus, 200,000,000
> Streptococcus haemolyticus and Streptococcus viridans, 500,000,000
> Influenza bacilli, 500,000,000
> Pneumococci of type I, II, III and IV, 500,000,000
> Friedländer bacilli, 100,000,000
> Micrococcus catarrhalis, 200,000,000

A series of nine injections of the following doses was given to each subject: 0.1 cc., 0.2 cc., 0.3 cc., 0.4 cc., 0.5 cc., 0.6 cc., 0.7 cc., 0.8 cc. and 1 cc. The smaller doses were given every three to five days, whereas the doses above 0.5 cc. were given at weekly intervals. In no case did any constitutional reaction occur. Many complained of slight soreness of the arm, which usually disappeared in from twenty-four to forty-eight hours. A few experienced transient symptoms of an acute cold within the forty-eight hour period following injection.

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15. Thomson, D., and Thomson, R.: Ann. Pickett-Thomson Research Lab. **8**:307, 1932.

In 1936 and 1937 questionnaires were sent to members of the group who were inoculated. On this questionnaire the following questions were asked:

1. Approximately how many colds did you experience in each year before receiving the cold vaccine?
2. What was the average duration of these colds?
3. How many colds did you have during the year immediately following the taking of the vaccine?
4. What was the average duration of these colds?
5. If you have since gone through one or more years without taking these inoculations, how many colds have you had in each year?
6. What was the average duration?
7. Do you feel that the injections have been of value to you? Please comment frankly.
8. Have you received inoculations in more than one school year?
9. If so, outline briefly the results obtained by each subsequent series of inoculations.
10. Please make any comment which may assist in properly evaluating the results of the treatment in your case.

No control series was used, as the primary purpose of the inoculations was to do something, if possible, for the group of students, and not to test the value of the vaccine. Then, too, it did not seem fair to exclude students wishing vaccination simply to provide a control group for the sake of statistics. To secure data from a group of students not particularly subject to recurrent colds would, of course, be of no value.

Although 94 replies were secured to the questionnaires, only 86 could be included in the final report on account of the fact that only

TABLE 2.—*Summary of Results of Vaccination*

Number of cases reported	86
Improvement in part or in toto	68, or 79%
Complete relief	18, or 21%
Freedom from any local predisposing factor	28
Number of this group improved	25, or 89%
Total number of colds per year before injection	479
Total number of colds per year after injection	181
Total number of days afflicted per year before injection	5,160
Total number of days afflicted per year after injection	1,666
Reduction in number of colds	298
Reduction in number of days	3,494

three months had elapsed since the completion of the series of inoculations for the 8 persons whose answers were discarded. All data reported were secured at least seven months after the completion of a series of injections. The ages of the students ranged from 17 to 39, with the great majority between 20 and 24. On tabulation of the results, it was found that in this group the total number of colds was 479 per year prior to treatment and 181 in the year subsequent to treatment. The total number of days for the group during which they suffered from colds dropped from 5,160 per year before treatment to 1,666 in the year after vaccination. Of the 86 subjects, 68, or 79 per cent, reported improvement subsequent to treatment. Of this group, 15, or 17.4 per cent, had no colds during the winter following the series of injections. Eighteen, or 21 per cent, were improved in no way by the injection. Of the 86 students, only 28 were completely free from any local condition that might be considered a predisposing factor, such

as granular posterior pharyngeal wall studded with lymphoid islands, slight nonsuppurative sinusitis or a borderline nasal deformity. Of this group, 25, or 89 per cent, were improved.

These figures are not presented as an argument in favor of prophylactic vaccination against colds, and one must guard against their unqualified acceptance. No control figures are available, which weakens their value to some extent. Yet if one takes the maximum reduction of colds which has occurred in any control series published to date, which is 30 per cent, one still has a 49 per cent improvement occurring in this group of students. It will be noted that the greatest improvement occurred in reducing the severity and duration of colds rather than in eliminating them. This would be in keeping with the virus causation, for if this is the method of production of most colds, one could certainly not expect to prevent their occurrence by the administration of a bacterial vaccine, but the chances of influencing the secondary stage, in which bacteria play a prominent part, might be considerable.

The questionnaire method of securing data is by no means ideal and leaves room for inaccuracies. The question of a "satisfied patient" hardly applies, however, for the college student is prone to be a dissatisfied patient unless he secures results. Finally, the series is not large, and possibly with ten times the number great changes in the results would occur. However, there is some indication that the length and severity of the acute colds of these students were reduced; no one suffered any injury from the treatment, and until something better is available it seems worth while to continue this form of therapy.

CONCLUSIONS

The analysis of the statistics concerning the series indicates that prophylactic vaccination against colds is followed by lessened severity and duration of the disease.

From six to ten small graduated doses of vaccine are more likely to secure results than are three large ones.

Vaccination can and should be carried out without producing constitutional symptoms.

There is little evidence that colds are prevented by this type of therapy.

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TRACHEOPATHIA OSTEOPLASTICA (OSTEOMA OF THE TRACHEA)

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Bony tumors in the trachea, bronchi and lung occur with great rarity. According to Hiebaum,[1] Luschka first described this phenomenon in 1856, and his report was followed by a report of a similar case by Wilks.[2] Hiebaum, in a review of the literature up to 1934, reported the occurrence of thirty such tumors in the lung and more than seventy involving the trachea. When such tumors or osteomas have developed in the trachea, the condition generally has been described as tracheopathia osteoplastica rather than as multiple osteoma of the trachea.

In the majority of cases of tracheopathia osteoplastica that have been reported in the literature there were few or no clinical symptoms and the condition was first recognized at necropsy. That such osteomas may produce symptoms has been emphasized by the Jacksons.[3] The symptoms produced are dependent on the size, number and distribution of the osteomas and usually consist of gradually increasing dyspnea, hoarseness, cough and expectoration. Schnitzer [4] in a study of records of cases and of material obtained at necropsy found that tracheopathia osteoplastica was more prone to appear in the fifth and sixth decades than at other times of life and usually was limited to the lower two thirds of the trachea, from where it might extend into the bronchi. The posterior, or membranous, portion of the trachea is strikingly immune to the

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1. Hiebaum, K.: Ueber Knochenbildungen in Lunge und Trachea, Frankfurt. Ztschr. f. Path. **47**:249-255, 1934.

2. Wilks, S.: Ossific Deposits on the Larynx, Trachea and Bronchi, Tr. Path. Soc. London **8**:88, 1857.

3. Jackson, Chevalier, and Jackson, C. L.: Benign Tumors of the Trachea and Bronchi, with Especial Reference to Tumor-Like Formations of Inflammatory Origin, J. A. M. A. **99**:1747-1753 (Nov. 19) 1932.

4. Schnitzer, Robert: Ueber Tracheopathia osteoplastica, Arch. f. Laryng. u. Rhin. **32**:236-298, 1920.

process of ossification. The osteomas first appear under the mucosa, between the cartilaginous rings, as small flecks, gradually increasing in size and number, and are hard but brittle.

The etiologic basis for the development of osteoma in the trachea or lung has not been established. The most prevalent hypotheses are: (1) that of Virchow,[5] who regarded such tumors as products of exosto-

Fig. 1.—Bronchoscopic appearance of the tracheal osteoma.

Fig. 2.—Fully developed bone with marrow cavities from the tracheal osteoma.

sis; (2) that of Ribbert,[6] who felt that the condition was a congenital anomaly of the *"perichondrales Bindegewebe;"* (3) that of Aschoff[7]

5. Virchow, Rudolf: Die krankhaften Geschwülste, Berlin, A. Hirschwald, 1864-1865, vol. 2.

6. Ribbert: Ueber die Entstehung die Geschwülste, Deutsche med. Wchnschr. **21**:24-26 (Jan. 10) 1895.

7. Aschoff, L.: Ueber Tracheopathia osteoplastica, Verhandl. d. deutsch. path. Gesellsch., 1910, pp. 125-127.

and of Brückmann,[8] who came to the conclusion that development of the tumors is dependent on an alteration of the elastic tissue elements of the trachea, and (4) that of Freund,[9] who was unable to demonstrate a direct relationship between the tumors and the elastic tissue but postulated origin of the growths from the connective tissue.

The case we wish to report is of interest not only because of the rarity of the disease but because of the presence of clinical symptoms and the size of the osteoma.

REPORT OF A CASE

A man, 40 years of age, first presented himself at the Mayo Clinic in January 1937, complaining that he had been troubled with gastric distress and gradually increasing dyspnea for the past fourteen years and that recently these symptoms had been associated with huskiness of the voice. The gastric distress was readily explained by the presence of a duodenal ulcer, definite evidence of which was obtained by roentgenoscopic studies. The physical and serologic studies otherwise gave negative results. Because of the dyspnea and huskiness of the voice, an indirect laryngoscopic examination was made, at which time multiple small nodules were visualized on the anterior wall of the trachea. The lesions, however, could not be visualized sufficiently clearly to establish a positive diagnosis, and bronchoscopy was advised. On bronchoscopic examination small hard gritty tumor masses were found studding the wall of the trachea, with the exception of the posterior, or membranous, portion, and reducing the lumen to approximately a third of its normal size (fig. 1). The nodules could be visualized as far down as the bifurcation and were too numerous to count. It was impossible to say whether the process extended into the bronchi, as it was impossible to advance a 9 mm. bronchoscope beyond the middle third of the trachea because of constriction of the lumen by the osteoma. The narrowing of the trachea and the irregularity of its wall caused by the osteoma were well illustrated in special roentgenologic studies of the trachea. Two of the nodules were removed by forceps for microscopic diagnosis (fig. 2).

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8. Brückmann, Erwin: Ueber Tracheopathia osteoplastica (Multiple Osteome in der Schleimhaut der Trachea), Virchows Arch. f. path. Anat. **200**:433-452, 1910.

9. Freund, A.: Ueber Tracheopathia osteoplastica, Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres **8**:11-40, 1914-1915.

SURGICAL TREATMENT FOR SUPPURATIVE PETROSITIS

A CRITIQUE

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In the discussion of the various technics employed in surgical treatment of purulent lesions in the pars petrosa the first significant fact that needs recognition is that lesions in this area vary considerably with each case. Therefore, it would be illogical for any one to conceive that any one given technic can be advocated as a standard method to be used for all types of petrosal infection. Eradication of the osseous tissue of the pars petrosa is the only surgical procedure that nearly approximates general adequacy to reach all types of petrosal lesions. However, lesions of the anatomic structures involved in the formation of the labyrinth are left untouched by it. The fact remains to be remembered that petrosal lesions give no indication that such an eradication of the entire petrosal contents is demanded to effect a cure in every case.

From all this the deduction is possible that surgical approaches toward the eradication of purulent lesions in the petrous pyramid should never fall into the category of routine surgical procedure. Rather the clinical situations demand so exact a diagnosis and differential diagnosis that particularization in the selection of the type of operation is made obligatory to the end that the type of operation used shall be adequate to relieve the patient of the lesion and its inherent threat to life, on the one hand, and, on the other hand, not more extensive and so-called "radical" than is absolutely necessary to accomplish the ends sought. Only in the rarest of instances are the clinical history so obscure, the laboratory data so insufficient and the operating surgeon so at a loss as to the exact location of the lesion that a general exploratory operation—a surgical search of the petrous pyramid for a lesion—is necessary; but sometimes this will be necessary and should be condoned under the special circumstances which demand it.

The clinical picture of a developing petrosal lesion has often been described and is beginning to be understood. It includes: (1) reappearance of the aural discharge after a period of cessation or its uninterrupted

Read at the Forty-Third Annual Meeting of the American Laryngological, Rhinological and Otological Society, Inc., Atlantic City, N. J., June 4, 1937.

continuance after the performance of a complete simple mastoidectomy, (2) periodic appearance of sensations of pain from branches of the first branch of the fifth cranial nerve, increasing in severity and intensity with decreasing periods of intermission until it is a continuing symptom, (3) low grade fever and increasing general malaise, (4) occasional transient inflammatory or irritative reactions from the living and functioning labyrinth and (5) occasionally signs of involvement of other cranial nerves—the sixth, the ninth, the tenth and sometimes the facial. These factors together with a positive roentgen picture—by which is meant a film depicting varying degrees of halisteresis of the pars petrosa to complete obliteration of evidence of bone structure—constitute the fundamental elements of a clinical picture which is becoming increasingly familiar, and to meet the clinical exigencies of which most physicians resort to surgical intervention. To be sure, because cases have been observed in which healing is spontaneous, the condition in many cases is not diagnosed while the lesion is intrapetrosal but is definitely recognized only when rupture has ensued and a peripetrosal involvement has resulted. The confusion results from failure to comprehend the elements of differential diagnosis between a progressing lesion and one which is receding. Almour [1] recently presented a paper dealing with the elements of this differentiation, which may be summarized as follows: The condition is in progression when the symptoms of pain in and around the eye change from a periodically present sign, become persistent and then suddenly cease to be present at all. Likewise, the discharge, which has been persistently present since the commencement of the symptoms from the petrosa, suddenly stops. The pus is finding egress elsewhere. The transitory phenomena continue with more frequent repetition, and, in addition, transient photophobia becomes evident. A late appearance of homolateral palsy of the abducens nerve occurs, or if such a palsy was present earlier—even before the simple mastoidectomy was undertaken—it does not show any immediate signs of improvement. In spite of a feeling of general well-being, additional cranial nerves become involved. Finally, the usual signs of meningeal irritation appear: there is slight pain in flexing the neck on the chest and the patient becomes increasingly irritable, refuses personal administration and wants to be left alone—indications of intensity of malaise—and the whole appearance, attitude and behavior indicate to a competent clinician that the patient is sicker than before. These symptoms occur in the face of an afebrile condition, absence of ocular pain and a decrease of the aural discharge.

1. Almour, R.: Paper presented before the Otolaryngological Section of the Medical Society of New York, May 26, 1937; to be published in New York State Journal of Medicine.

On the other hand, a petrosal lesion is in recession when the pain in and about the eye, instead of suddenly ceasing, gradually diminishes both in the intensity and in the duration of its periodic attacks. The intervals between attacks are longer. Likewise, the aural discharge instead of suddenly stopping, gradually lessens in amount. Constant competent supervision and observation show that no transient phenomena are presented due to irritative reactions from vital structures located within the pars petrosa. When palsy of the abducens nerve is present, it unquestionably shows itself as improving. Lastly, by attitude, behavior and appearance the clinician can be sure that the patient begins to look better, takes an increasing interest in his surroundings and shows an improved morale. Under such circumstances the petrosal lesion is receding and spontaneous recovery is to be expected.

Finally, when a petrosal lesion is recognized, every effort should be devoted primarily to its exact localization, and a brief consideration of the factors entailed in making such a determination of location is in order.

In the majority of instances the clinician is faced with a postoperative phase of the clinical picture. While it is true enough that petrosal infections are complications of involvement of the middle ear, the dramatic clinical picture of the involvement of the mastoid overshadows and beclouds the less intense reactions of the petrosal tissue, and usually a simple mastoidectomy has already been performed when the question of further surgical intervention, particularly an operation involving the petrosa, is under discussion because of features which the condition then presents to the examiner. At this time an attempt to diagnose the localization of the petrosal lesion should be made. The success with which this is done will determine the selection of the type of surgical intervention on the petrosal pyramid to be undertaken.

In papers read before the American Otological Society [2] it was shown that the lesions confined to the region of the posterior part of the perilabyrinth are easiest to manage. In many of these, a thorough simple mastoidectomy suffices and often uncovers a fistula located above the horizontal semicircular canal and behind the superior semicircular canal. If these fistulas are found, widened and drained, the clinical picture will be started toward those phenomena which I have indicated as denoting the process to be in recession. When symptoms of recession do not promptly ensue, other measures become necessary. Sometimes a fistula is located below the posterior semicircular canal. This too, uncovered by complete simple mastoidectomy, often ends in recession of the symptoms. When a fistula is located in the posterior internal region, the simple mastoidectomy must encompass removal of the plate

2. Symposium on Fundamentals in Regard to Suppuration of the Petrosal Pyramid, Ann. Otol., Rhin. & Laryng. **44**:1003, 1935.

of bone over Trautman's triangle, uncovering of the anterior cerebellar surface and separation of the dura from the bone toward the internal meatus. Often skeletonizing of the posterior part of the perilabyrinth, outlining the semicircular canals, is necessary.

The petrosal lesions confined to the region anterior to the labyrinth present a graver problem. They cannot be reached at all when surgical intervention is limited to the technic of the simple mastoidectomy because the region is not exposed by this procedure. In my opinion, neither the dural approach nor anything short of a tympanomastoidectomy permits an easy approach to lesions located anterior to the labyrinth without inherent danger to the patient. This includes anterior supracochlear as well as subcochlear and precochlear lesions, and of course it includes closed empyema of the region located at the so-called pyramidal apex.

Before a final decision is made, a careful inspection of the wound coupled with an otoscopic examination is undertaken. After one has performed a properly carried out simple mastoidectomy, the surfaces of the wound should be more or less covered by healthy, healing granulations. After the first week the discharge from the antrum should be meager. The involvement of the middle ear should also be in recession and the discharge meager. In the instance in which the osseous perilabyrinthine tissue is involved in a purulent lesion, there will be excessive discharge from the area involved into the mastoidectomy wound, and the aural discharge will not be increased, nor will otoscopic examination of the drum show increasing signs of pressure and a pulsating discharge. On the other hand, when the osseous perilabyrinthine lesion is located anterior to the cochlea, the discharge into the mastoid wound will hardly be enhanced. This wound may even show all the signs of progressive healing, but otoscopic examination will show advancing signs of purulent involvement. There is continued drooping of the posterior wall of the superior canal; there often will be a recurrence of pulsation of the middle ear, with no confused pressure in the mastoid cavity to account for it, and the membrana tympani is much thickened and edematous. Thus, it is reasoned that the lesion must be in front, below or mediad (inward) from the labyrinth. In a search for fistulas in this area, a radical mastoidectomy is necessary as a preliminary step in procedure. It cannot contribute to one's feeling of competency to remove the tegmen, expose the cerebral dura and lift it from the bone to which it is rather firmly attached in an endeavor to avoid radical mastoidectomy and in the hope of healing and curing a process in which fistulas have developed in the sections of the pars petrosa lying anterior to the labyrinth. Often the determination of the location of such fistulas, their enlargement and subsequent drainage suffice to change the clinical course in such a case and to

start the patient on the road to recovery, whereas the extensive intracranial operation itself not only fails to locate the fistulas but adds dural trauma to the situation and is undoubtedly to be considered a factor tending to increase the gravity of the prognosis and to be an element in the subsequent development of a meningeal infection. When a fistula is discoverable, its walls are still often intact and the endocranial cavity has not yet been reached by the lesion.

My whole endeavor is to make both the diagnosis of the lesion and a determination of its principal location while it is intrapetrosal. While it is intrapetrosal, there exists no reason for opening into any peripetrosal space. There is no logical reason for emptying purulent material into uninfected areas, whether these are intracranial or pharyngeal. It would be surgically as logical to enter the mastoid process by removing the squama of the temporal bone, lifting the dura off the tegmen and then opening into the mastoid process from this dural route. No otologist would accord such a suggestion a serious thought. Why then shall one not enter the petrous bone with the same regard for the integrity of the cranial cavity? There are other factors which will be dealt with when I discuss specific types of operative procedure. If delay is entertained and watchful waiting is the adopted procedure until peripetrosal rupture ensues, then the gravity of a prognosis is greatly increased on the one hand, the lesion in the bone is less sharply defined on the other and the symptom complex is altered by the advent of irritative phenomena coming from extradural collections of pus and signs which these produce by pressure on the underlying brain centers, to say nothing of the advancing signs of meningeal infection, which may so cloud the specific picture from the infected petrosal lesion that it may be entirely overlooked, to be recognized again at autopsy.

From this autopsy material many excellent specimens result, but these are hardly helpful in dealing with the living organism; the generally defeatist attitude of pathologists is too well known for one to expect from them fruitful suggestions for active therapy. They deal too much with what is past and gone to be vitally aware of the significance attached to the pathologic picture in the living subject and its current changes in tissues or to be more helpful than to act as historians of tissue phenomena that occurred in the past.

The endeavor to avoid performing a radical mastoidectomy accounts for the multiplicity of suggested surgical technics. If my observations made in cases in which radical mastoidectomy was undertaken are any criterion, the findings in the spaces of the middle ear in these cases do not warrant the avoidance of radical mastoidectomy. Furthermore, in many cases healing has occurred leaving an intact cranial cavity

and a dry ear after a radical mastoidectomy with removal of the pus, granulations and detritus from the spaces of the middle ear was done and a large fistula was located at the tubotympanic orifice, which adequately drained the purulent material from the petrosal infection. These results leave me questioning what it is that is being so studiously saved by the avoidance of radical mastoidectomy. In these cases the intracranial cavity was not exposed to infection, because the lesion had been diagnosed while it was intrapetrosal, and the surgeon did not expose it or traumatize it in his performance of a so-called radical mastoidectomy. Hence, the number of recoveries recorded is gratifying. The conclusion is drawn, therefore, that radical mastoidectomy becomes imperatively indicated in some cases and that the avoidance of it and the performance of surgical operation on the dura in lieu of it is a service which from the facts adduced needs a revaluation and a reconsideration.

SURGICAL TECHNICS

For the handling of a purulent process in the pars petrosa in the face of a progressing clinical picture, numerous surgical procedures have been proposed, each of which has its ardent advocates. I am no advocate or partisan for any one of these. I believe that most of them have a specific usefulness and should be employed when they hold out definite promise of reaching a specifically diagnosed type of lesion presenting itself at the time of operation. Each physician who professes competency in otologic surgery should know expertly and be prepared to perform any of these operations when conditions are present indicating that a given surgical technic and no other procedure will meet the situation. The adoption of a routine technic for all cases not only stamps the advocate of it as unable to make a differential diagnosis of petrosal lesions but also is likely to lead to wrong clinical conceptions of this lesion and finally to a greater mortality than my experience shows to be necessary.

I propose to discuss briefly some of the outstanding technics which have been presented to otologists from authoritative sources. Naturally, there are local modifications which given situations present to individual surgeons. These need not be discussed here. I shall confine this critique to fundamentals which should be comprehended in detail. The first fundamental consists in an answer to the questions: Does the technic under scrutiny reach the lesion easily and without danger to adjacent tissues and structures, and when the lesion is healed and the patient cured, is there the nearest possible approach to the normal? Were the surgical steps taken absolutely necessary, and were they the only ones which would meet the indications present? What, if any, additional risk did the surgical procedure employed bring? Could this have been

avoided? These questions are pertinent now, because knowledge of this lesion has progressed sufficiently to permit one to discard surgical technics based on anatomic and theoretical conceptions and not performed in what I consider unequivocal circumstances or in enough cases to permit a comparative study of results obtainable from them.

I take it that I need not dwell on the details of technic of the standard procedures. All otologists know what is implied by the Eagleton operation. This is one of the procedures which employs the extrapetrosal, or subdural, approach. In the domain of cranial surgery, there is a procedure designated as the gasserian ganglion approach. This likewise is an approach through the subdural route. The criticism voiced is pertinent for both these procedures. In the absence of an extradural collection of pus which might furnish cogent reasons for employing either of them, they present harmful factors inherent in their procedures. It is impossible to inspect the inner tympanic wall and search for fistulas lying below the cochlea or anterior to the labyrinth when the gasserian ganglion approach is used. When only a simple mastoidectomy has been performed, the elevation of the dura must of necessity be started behind the semicircular canal, and in this way the insertions of the dural into the subarcuate fossa are torn. The petrosal nerve is also invariably torn, but the proponents of the procedure do not point this out. The vascular channels between the tegmen and the dura (the dural vessels being part of the skeletal system) are all torn, and the ends of the vessels traumatized are subsequently bathed in purulent material and exposed to infection, when this could have been avoided by going directly to the lesion through the bone. When a radical mastoidectomy is part of the procedure, as Eagleton has advocated, the procedure is more rational, because further surgical intervention may be stopped after an inspection of the exposed mesial portion of the tympanomastoid wall and if fistulas are found, nothing additional need be done. After the radical mastoidectomy is performed, elevation of the dura may be started from in front of the subarcuate fossa and the point of emergence of the petrosal nerves, thus sparing these areas, but the general criticism of dural trauma persists. When large portions of the squama have been removed, cerebral displacement permits an easier elevation of the dura. The performance of ventricular puncture to withdraw ventricular fluids to facilitate elevation of the dura is little help, since the attachments of the dura to the petrosal ridge of the pyramid remain fixed and are nevertheless traumatized in the attempt at elevation of the dura, and add another factor to the gravity of the prognosis by exposure to infection. The Eagleton operation is more applicable to lesions located posteriorly and superiorly which have traveled forward above the labyrinthine capsule toward the so-called apex.

It finds its most logical application when an extradural peripetrosal accumulation of pus is either diagnosed or suspected. For a lesion which shows evidence of involving the posterior fossa wall of the petrosa or its infralabyrinthine and anterior portions, this procedure would seem not to meet the indications at all.

Voss advocated attacking the lesion by modifying a radical mastoidectomy. He particularly stressed extensive exenteration of the epitympanic space. Of what use is exposure of the epitympanic space unless the space is the seat of a fistula? An apical suppuration which is draining elsewhere is not reached, and an enclosed empyema of the area near the so-called tip is untouched. Finally, if the tract does open in the posterior superior region at or near the semicircular canals, the subsequent drainage has to be uphill. I have observed cases in which pus was produced from this area and in which additional openings were subsequently required to provide through and through lavage before cure was effected.

Frenckner's method, which consists in entering the petrosa through the arch of the superior semicircular canal, requires complete exposure of the attic area. The petrosa is entered with a fine curet, and the cancellous osseous tissue between the horizontal and the superior semicircular canal is removed. The tract is followed forward and inward toward the tip. This at least is an attempt at an intrapetrosal approach to the lesion. It does not traumatize the dura, but neither does it seem as applicable to infracochlear lesions and those lying anterior to the cochlea as it is to those situated postsuperiorly. In closed empyema there often is no cell tract leading toward the tip in this region. When dense bone rather than cancellous osseous tissue is encountered, the removal of the bone and the creation of a tract from beneath the arch of the superior semicircular canal toward the tip prove extremely difficult. Finally, Frenckner's procedure will not reach, give knowledge of or locate a fistula which is already established at the tympanic orifice of the eustachian tube. It seems a technic of limited applicability in selected cases. It entails no danger to the patient, and it does not increase the gravity of the prognosis. If it locates and tends to evacuate a purulent lesion, it accomplishes its purpose and should be used.

The Almour technic is not advocated for use in all types of involvement. It is advocated specially for the drainage of pus from the apex in cases of encapsulated empyema of the petrosa in pneumatized petrosal pyramids and when extensive and persistent search for them has failed to show the presence of any fistulous opening. The procedure reaches the apex without elevation of the dura and its resultant trauma. It adequately affords drainage at the point where nature often erupts the purulent material, and in properly selected cases it is sufficient to effect a cure. Of course, it necessitates the performance of a preliminary

radical mastoidectomy. When rupture extrapetrosally has occurred and an epidural accumulation of pus has resulted, this must be evacuated, and therefore the Almour procedure alone is not sufficient to meet the indications for surgical intervention which such a case presents. This too is an intrapetrosal approach. It can be employed without entering extrapetrosal regions. It is not disfiguring, does not touch the cochlea and, when properly done, injures no structure in addition to the one under surgical attack.

Ramadier's procedure entails the performance of a radical mastoidectomy. The anterior membranous auditory canal is dissected away from the bony canal, and the soft parts are freed to expose the glenoid fossa. The anterior bony wall of the canal is separated from the capsule of the mandibular joint, and this wall and part of the floor of the external canal are removed. The tegmen tympani and the tegmen antri are next removed. The posterosuperior part of the glenoid tubercle is then resected. This brings into view the tympanic orifice of the eustachian tube and exposes the internal carotid artery to view by removal of the bone of the anterior wall below the orifice of the tube. The ascending portion of the carotid artery is exposed by extending the removal of bone upward, and finally the entire horizontal portion and the bend in the artery are exposed. A ligature is then passed around the artery, and it is gently pulled out of its canal. Through the channel in the petrous bone thus exposed, entry into the pyramid is effected, accumulated pus evacuated and drainage attempted. This operation is feasible, and can be done without much difficulty, but when the hole is made into the petrosa, replacement of the artery blocks the opening made in the groove in which it lies. Theoretically, I believed that an infection coming from a small opening and spreading along the venous plexuses about the carotid artery might carry infection to these vessels. Having on three occasions exposed the carotid artery in its canal in the presence of a purulent process with no such results, I must revise this opinion. I still feel, however, that if the situation presented is closed empyema in the region of the tip, the Almour procedure is both more easily done and less extensive. The same purposes are accomplished by Ramadier's operation and by Almour's; so why not perform the one which is less extensive?

Last September there was brought to me a paper by Doctor Lempert,[3] which advocated a technic which closely approximates the Ramadier pro-

3. Lempert, J.: Complete Apicectomy (Mastoidotympanoapicectomy): A New Technic for the Complete Exenteration of the Apical Carotid Portion of the Petrous Pyramid, Arch. Otolaryng. **25**:144 (Feb.) 1937; Complete Apicectomy: Preliminary Report of a New Technic, New York State J. Med. **36**:1210 (Sept. 1) 1936.

cedure but additionally permits complete evisceration of all the osseous structures in the petrosal pyramid. It would be well for all otologists to reread the original publication of this procedure. Briefly, the technic follows the procedures just indicated in the Ramadier operation, except that when the carotid artery has been exposed, instead of pulling the artery from its bed in its canal, with possible injury to its attachments, one works away from the artery, removing the bone of the carotid plate millimeter by millimeter and evacuating the entire interior of the diseased petrosa. Proceeding carefully, the surgeon removes the entire interior until inspection of all the walls is possible. Lempert's method combines with evisceration of the interior of the petrosal pyramid removal of the tegmen forward, breaking of the bone away from the dura downward and extensive exposure of the middle cranial fossa.

This is the only procedure known to me which permits examination of the wall lying against the posterior cranial fossa anterior to the labyrinth. If a break in contour is noted, there are no difficulties in widening the exposure, just as one does when one finds an eroded spot on the inner table of the mastoid process. It permits drainage of the middle as well as the posterior cranial fossa in cases in which meningitic infection has taken place. It does not entail injury to the facial or the petrosal nerve or to the cochlear or the semicircular canals. Almour and I have performed this operation three times. All the patients are cured. One had cerebellar and meningitic symptoms prior to coming under my observation. In none of these three cases was there any hemorrhage from the carotid plexus, nor was there any untoward after-effect from interference with the mandibular joint.

I believe this operation will eventually find its proper place among the surgical resources to meet the situation presented by broken-down purulent petrosal contents which fail to drain adequately from fistulas or from surgical openings made for drainage. It permits the removal of septic foci in the depths of the petrosa threatening meningeal inflammatory reactions to bacterial invasion of the endocranium from this diseased bone. By and large, it is the best procedure thus far advanced to meet the situation with which otologists are sometimes confronted. It alone of all procedures permits inspection and surgical treatment of the posterior cranial fossa surface of the petrosal pyramid.

SUMMARY

Surgical operation on the petrosal pyramid should be limited as much in extent as the situation of the lesion permits. No one advocated procedure is applicable to all types of involvement and to all the varying lesions which may be presented in the pars petrosa.

Diagnosis should endeavor to recognize the lesion while it is still intrapetrosal. The factors determining an advancing and progressing lesion must be differentiated from those characteristic of one that is in recession and from which recovery is to be expected. In this connection, recognition must be given to the fact that many petrosal infections heal spontaneously after the performance of adequate simple mastoidectomy.

The simple mastoidectomy alone will suffice usually only when the lesion is limited to the posterior labyrinthine area.

Complete simple mastoidectomy and the location of a posterior labyrinthine fistula suffice, provided the operation is promptly followed by a remission of all symptoms and this improvement is permanent.

When the lesion is located in the area encompassed by the epitympanic space, the Voss procedure may be used. Its results must be judged by prompt remission of all symptoms, as are those of the complete simple mastoidectomy.

When anterior labyrinthine fistulas are suspected or enclosed empyema of the tip area is diagnosed, a complete radical tympanomastoidectomy combined with search for such fistulas should be undertaken. When found, such fistulas should be adequately drained. Nothing more is needed if symptoms from the petrosal infection then subside. If, however, the clinical picture instead of subsiding, continues or increases in intensity, the Almour technic is indicated to evacuate encapsulated empyema. Roentgenograms will materially furnish diagnostic data.

If after one has established adequate drainage from spontaneously formed fistulas or by the Almour procedure the patient nevertheless continues to present increasing signs and symptoms threatening extrapetrosal rupture or meningeal infection, the Lempert technic holds out the best means of completely removing the purulent focus within the pars petrosa and should be undertaken.

Almour and I have handled forty-six cases of proved purulent infection in the petrosal pyramid. In ten cases there was a posterior labyrinthine fistula. In twenty-one there was an anterior labyrinthine fistula. In four there were an anterior and a posterior fistula. In seven there was enclosed empyema of the pars petrosa. In eleven meningitis was present prior to our operative procedures, and four of the patients died. There were eight deaths and thirty-seven cures in all. In three of our cases evacuation of the purulent material took place through a gravity abscess in the lateral pharyngeal wall. We had one patient with meningitis who has recovered. We performed a simple mastoidectomy ten times and drained fistulas. We performed a radical mastoidectomy twenty-five times and drained fistulas. We operated by the Almour technic for enclosed empyema eight times. We used the Lempert technic

three times, with three cures. In one case the condition was recognized but no operation was done except simple mastoidectomy. This was the first case of our series, in which the lesion was studied at autopsy and which started us on this work.

We have observed many cases in which the condition was diagnosed by others as petrosal involvement but in which the symptoms did not meet our criteria for establishing the diagnosis. These are not included in our record, nor are the few cases we observed in which there was a symptom-complex of petrositis and in which healing occurred without resort to additional surgical treatment. In these cases there was no pathologic proof of petrosal involvement. This summary comprises only cases in which a pathologic condition was demonstrable in the pars petrosa.

DEAFNESS ASSOCIATED WITH MENINGOCOCCEMIA

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Deafness resulting from meningococcic meningitis is a well recognized complication. Neal's [1] series of 650 cases contained 26 instances of deafness, Cook, Lyon and Mitchell [2] reported deafness in 3 of a series of 87 cases. McLean and Caffey [3] reported deafness in 4 of 44 cases. Eleven cases of deafness were noted in 144 instances of epidemic meningitis by Smithburn, Kempf, Zerfas and Gilman.[4] It is usually stated that the deafness has little tendency to improve and that it is due to a lesion of the auditory nerve.

Oppenheim [5] stated that the lesion consists of purulent invasion of the eighth cranial nerve, with extension to or actual involvement of the cochlea and the meninges in the original assault by the meningococcus. Earlier writers [6] (Moos, Steinbrugge and Schultze) found the eighth cranial nerve hyperemic and infiltrated with cells in the early stages and later bathed in pus. Steinbrugge observed a case in which the nerve fibers were entirely destroyed. Schultze reported a case of meningitic deafness in which the eighth cranial nerve was atrophic and sclerotic. Recent writings on the pathologic picture and the pathogenesis

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1. Neal, J. B.; Jackson, H. W., and Appelbaum, E.: Epidemic Meningitis, J. A. M. A. **87**:1992 (Dec. 11) 1926.

2. Cook, W. C.; Lyon, R. A., and Mitchell, A. G.: Neurologic Complications and Sequelae of Meningococcus Meningitis, Arch. Pediat. **49**:807 (Dec.) 1932.

3. McLean, S., and Caffey, J. P.: Sporadic Meningococcus Meningitis, J. A. M. A. **87**:91 (July 10) 1926.

4. Smithburn, K. C.; Kempf, G. F.; Zerfas, L. G., and Gilman, L. H.: Meningococcic Meningitis, J. A. M. A. **95**:776 (Sept. 13) 1930.

5. Oppenheim, H.: Lehrbuch der Nervenkrankheiten, ed. 7, Berlin, S. Karger, 1923, p. 1186.

6. Moos, S.; Steinbrugge, H., and Schultze, cited by Benesi, O., and Sommer, J.: Neuritis toxicans nervi octavi, in Alexander, G., and Marburg, O.: Handbuch der Neurologie des Ohres, Berlin, Urban & Schwarzenberg, 1929, vol. 2, pt. 2, p. 820.

of the deafness occurring in meningococcic meningitis are difficult to find.

We wish to report a case of deafness occurring in the course of meningococcemia without meningeal involvement. No similar case could be found in the literature.

REPORT OF A CASE

M. F., a 22 year old man, was admitted to the Cook County Contagious Disease Hospital on March 10, 1935. He complained of sore throat and a "cold" of several days' standing. These were not severe enough to cause him to go to bed. Twenty-four hours before his admission, however, he became acutely ill, with high fever, severe headache and repeated vomiting. The family physician made a diagnosis of meningitis and advised immediate hospitalization.

Examination revealed a fairly well nourished white man acutely ill. There was no impairment of hearing, and his only complaint was of severe headache. He answered questions rationally. The temperature was 100 F., the pulse rate 112 and the respiratory rate 24. The eyes, ears and nose presented no abnormalities. There was no pharyngeal injection. The neck revealed no rigidity, although a suggestion of a Brudzinski sign was present on marked flexion of the neck. The thorax, lungs, heart, abdomen and extremities presented no abnormalities. The skin of the trunk and extremities, however, was covered with numerous petechiae, varying in diameter from 0.5 mm. to 1 cm. The patellar reflexes were hyperactive, but no Kernig or Babinski sign was present. Because of the obvious serious illness of the patient and the cutaneous manifestations, a diagnosis of meningococcemia with possible meningitis was made. One hundred and five cubic centimeters of antimeningococcus serum (Lederle) in 200 cc. of a physiologic solution of sodium chloride was given intravenously by the drip method. This was repeated the next day. The patient seemed much improved.

From a specimen of blood drawn on the patient's admission the laboratory reported the recovery on culture of gram-negative, biscuit-shaped diplococci belonging to the neisserian group.

On March 12, two days after his admission, the patient complained of tinnitus and difficulty in hearing. Examination of the middle ears disclosed no abnormalities. He could not hear the ticking of a watch placed close to either ear. In addition to this, he had pain and swelling of the knees and wrists. On March 16 his temperature, which had never been above 100 F., rose to 102.4 F., with clinical signs of meningeal irritation. Spinal puncture, however, revealed only clear fluid under slightly increased pressure. The spinal tap was purposely avoided, since it is known that in the presence of proved meningococcemia without meningitis spinal puncture may precipitate extension to the meninges. The next day (March 17) his highest temperature was 100.4 F. He was covered with an urticarial eruption accompanied by severe itching. This subsided in two days. His right knee, however, became more swollen and filled with fluid. On March 22 100 cc. of green pus was aspirated. He was discharged on March 23, fourteen days after his admission, well but with bilateral deafness.

COMMENT

Since meningitis was not present, the deafness could hardly be attributed to purulent invasion of the auditory nerve or the inner ear. The administration of serum as a possible cause seems unlikely also, since the serum sickness was of only moderate severity and occurred

several days after the deafness was first noted. Although neurologic complications are known to occur after the use of serum, they are most frequent after the use of tetanus antitoxin. In a recent review Doyle [7] analyzed 49 cases. In 39 instances the complication followed the use of tetanus antitoxin, and in only 1 did it occur after the use of antimeningococcus serum. Most of the nerves affected were those of the brachial plexus.

Amberg and Hewitt [8] described a case of deafness occurring in the course of tetanus. They concluded that the deafness was due to the disease, the antitoxin or the use of phenobarbital.

Cutter [9] recently reported a case of nerve deafness occurring at the height of the serum reaction after the administration of a large dose of tetanus antitoxin. While he concluded that the deafness was due to the antitoxin, it would appear that the disease itself may well have been the cause of it.

The deafness in our case appeared to be comparable to the deafness of the inner ear occurring occasionally in several other diseases, notably mumps, diphtheria, scarlet fever and tetanus. It will be noted that an exotoxin is elaborated in each of these diseases with the exception of mumps. That the different bacteria which elaborate exotoxins which circulate in the blood stream can produce pathologic lesions in the inner ear has been shown by Beck.[10] He demonstrated definite changes in the cochlea and the spiral ganglion after the intravenous injection of the exotoxins of Bacillus diphtheriae, a staphylococcus and Bacillus dysenteriae. Since Ferry and his associates [11] have proved that the meningococcus also produces an exotoxin, it occurred to us that perhaps the deafness occurring in meningococcic infections is also due to the toxic action of the exotoxin on the inner ear. This conception is strengthened by the experience of Hoyne,[12] who has treated more than 300 persons with meningococcic meningitis and meningococcemia with meningococcus antitoxin, without a single case of deafness occurring after treatment with antitoxin was started. Further confirmation must await the actual

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7. Doyle, J. B.: Neurologic Complications of Serum Sickness, Am. J. M. Sc. **185**:484 (April) 1933.

8. Amberg, E., and Hewitt, R. S.: Tetanus, Tetanus Antitoxin or Phenobarbital Deafness, J. A. M. A. **105**:585 (Aug. 24) 1935.

9. Cutter, R. D.: Auditory Nerve Involvement After Tetanus Antitoxin, J. A. M. A. **106**:1006 (March 21) 1936.

10. Beck, K.: Experimentelle Untersuchungen über den Einfluss von Bakterientoxinen und Giften auf das Gehörorgan, Ztschr. f. Ohrenh. **68**:128, 1913.

11. Ferry, N. S.; Norton, J. F., and Steele, A. H.: Studies of the Properties of Bouillon Filtrates of the Meningococcus, J. Immunol. **21**:293 (Oct.) 1931.

12. Hoyne, A. L.: Personal communication to the authors.

production of lesions in the inner ear by the intravenous injection of meningococcus toxin, as was done by Beck [10] with other bacterial toxins.

SUMMARY

A case of deafness associated with meningococcemia without meningitis is reported.

A nonsuppurative process in the inner ear, possibly caused by the exotoxin of the meningococcus, seems a reasonable explanation of the cause of deafness in this case.

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OTITIC MENINGITIS

REPORT OF A CASE IN WHICH TREATMENT WAS FOLLOWED BY RECOVERY

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The treatment given a patient with meningitis (Streptococcus haemolyticus) following mastoiditis which complicated scarlet fever is of interest, as it was followed by the unusual result of complete recovery. Surgical drainage of the mastoids was done. The value of repeated blood transfusions [1] to combat the strong hemolyzing influence of this type of infection was recognized, and that agent was used. Frequent spinal taps were done for the reduction of intracranial pressure. In addition to the aforementioned treatment, the following therapy was used: convalescent scarlet fever serum [2] both intravenously and intraspinally together with a derivative of sulfanilamide (prontosil) [3] intramuscularly and sulfanilamide by mouth.[4]

REPORT OF CASE

J. W., a boy 6 years old, was admitted to the scarlet fever ward of the Willard Parker Hospital on Oct. 28, 1936, the fifth day of his illness. Five days before coryza had developed, with malaise; on the following day a slight

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From the otolaryngologic service of the Willard Parker Hospital, Department of Hospitals, New York.

1. Stephenson, Ruth: Nonspecific Immunotransfusion in Hemolytic Streptococcus Septicemia: Analysis of Blood Changes by the Schilling Method, J. A. M. A. **100**:100 (Jan. 14) 1933.

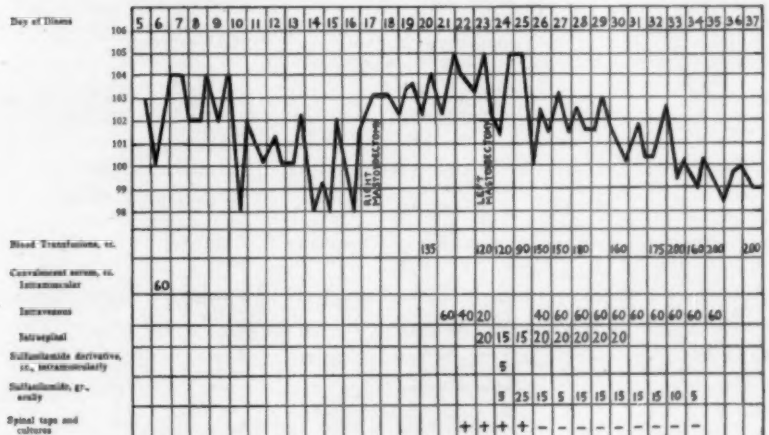
2. Thalhimer, W.: The Prophylactic and Therapeutic Value of Convalescent Serums in Some of the Acute Infectious Diseases, Ann. Int. Med. **10**:373-378 (Sept.) 1936.

3. The Council on Pharmacy and Chemistry of the American Medical Association has adopted "sulfanilamide" as the nonproprietary name for para-aminobenzenesulfonamide base, which has been called prontylin among other names. Various derivatives have been called prontosil. The preparation used was the disodium salt of 4′-sulfamidophenyl-2-azo-7-acetylamino-1-hydroxynaphthalene-3,6-disulfonic acid.

4. Domagk, G.: Ein Beitrag zur Chemotherapie der bakteriellen Infektionen, Deutsche med. Wchnschr. **61**:250-253 (Feb. 15) 1935. Colebrook, L., and Kenny, M.: Treatment of Human Puerperal Infections and of Experimental Infections in Mice with Prontosil, Lancet **1**:1279-1286 (June 6) 1936. Colebrook, L.; Buttle, G. A. H., and O'Meara, R. A. Q.: The Mode of Action of P-Aminobenzenesulphonamide and Prontosil in Haemolytic Streptococcal Infections, Lancet **2**:1323-1326 (Dec. 5) 1936.

rash on the chest and sore throat appeared, and on the third day, fever and a punctate rash on the arms and chest. On the day of admission he complained of pain in the right ear. He had had no previous communicable disease or illness other than an earache on the right side three times in the previous month.

Examination after admission to the ward revealed a well nourished and well developed child, moderately ill, with a faint punctate erythematous rash diffusely spread over the trunk and extremities. The eyes were normal. The right ear drum showed some fulness and injection; the left drum, slight injection only. The nose was obstructed with mucopurulent secretion. The tongue was heavily coated. There was a thick postnasal secretion on the pharyngeal wall. The tonsils were hypertrophied and injected, but no membrane was seen. A few pea-sized palpable cervical glands were felt on both sides. The heart was not enlarged, but a harsh systolic murmur was heard at the apex and in the pulmonic


Day of Illness
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
106
105
104
103
102
101
100
99
98
RIGHT MASTOIDECTOMY
LEFT MASTOIDECTOMY
Blood Transfusions, cc.
135 120 120 90 150 150 180 160 175 200 160 200 200
Convalescent serum, cc. Intramuscular
60
Intravenous
60 40 20 40 60 60 60 60 60 60 60 60 60
Intraspinal
20 15 15 20 20 20 20 20
Sulfanilamide derivative, cc., intramuscularly
5
Sulfanilamide, gr., orally
5 25 15 5 15 15 15 15 15 10 5
Spinal taps and cultures
+ + + + - - - - - - - - -
Blood cultures
- - - - - -

Temperature chart and treatment given.

area. The lungs, abdomen and nervous system were normal. The temperature was 102.8 F., the pulse rate 110 and the respiratory rate 26. The diagnosis was scarlet fever with otitis media.

On the sixth day of the illness a spontaneous purulent discharge was observed from both ears, that on the right being more profuse than that from the left.

As noted on the chart, the temperature remained between 102 and 104 F. from the fifth to the tenth day, at which time it took a sudden drop to 98.4 F. From the tenth to the sixteenth day of the illness the curve was spiked, though the temperature was not much above 102 F. at any time. Although the blood culture was negative, the child looked as though sinus thrombosis might be developing. The roentgenogram of the right mastoid showed definite destruction of the bony septums. The canal wall began to prolapse. A simple mastoidectomy was performed. Free pus and necrosis of the bone were found. The lateral sinus plate was eroded, but there were no granulations on the sinus wall, and the sinus seemed to be patent on palpation. The dural plate was soft and was removed. At the same time roentgenograms of the left mastoid had shown no

evidence of destruction, only slight clouding in the region of the antrum. The discharge from the left ear was not profuse, and the drum had the appearance of resolution. The temperature remained between 103 and 104 F., and on the fifth postoperative day it rose to 105 F. Culture of the spinal fluid from the fluid obtained on that day revealed Str. haemolyticus.

The left ear stopped discharging, and there was no tenderness of the mastoid. The drum was approaching a normal appearance; repeated roentgen

Reports on Spinal Fluid from Dr. J. B. Neal's Laboratory

Day of Illness	Date Fluid Withdrawn	No. of Specimen	Amount and Appearance	Cytologic Picture	Smear	Culture	Chemical Findings		
							Albumin	Globulin	Sugar
22	11/14	1	0.5 cc.; hazy	Great increase in cells, polymorphonuclears, 50%	Negative	Numerous colonies, hemolytic streptococcus	..	..	..
23	11/15	2	Hazy	Polymorphonuclears, 98%; degenerated cells	Few groups cocci in pairs and chains	Hemolytic streptococcus	++	++	—
24	11/16	3	5 cc.; hazy	Polymorphonuclears, 90%	Occasional gram-positive cocci intracellular	Heavy growth, hemolytic streptococcus	+1	+1	±
25	11/17	4	20 cc.; slightly cloudy	Large increase in polymorphonuclears	Occasional gram-positive cocci	8 colonies hemolytic streptococcus, 18 hr.	+	+	±
26	11/18	5	10 cc.; slightly cloudy	Polymorphonuclears, 95%	Negative	Negative, 24 hr.	+1	+1	+
27	11/19	6	20 cc.; cloudy	Large increase in polymorphonuclears	Negative	Negative, 24 hr.	+1	+1	+1
28	11/20	7	15 cc.; cloudy	Large increase in polymorphonuclears	Negative	Negative, 24 hr.	++	++	+
29	11/21	8	0.5 cc.; hazy	Polymorphonuclears, 90%	Negative	Negative, 24 hr.	..	..	..
30	11/22	9	20 cc.; cloudy	Large increase in polymorphonuclears	Negative	Negative, 24 hr.	+++	+++	++
31	11/23	10	5 cc.; slightly cloudy	Polymorphonuclears, 90%	Negative	Negative, 24 hr.	++	++	+
32	11/24	11	5 cc.; hazy with web	Polymorphonuclears, 85%	Negative	Negative, 24 hr.	+1	+1	+
33	11/25	12	25 cc.; hazy	Mononuclears, 75%	Negative	Negative, 24 hr.	+	+	++
34	11/26	13	10 cc.; hazy	Moderate increase of degenerated cells and mononuclears	Negative	Negative, 24 hr.	++	++	++

examination showed less clouding than the previous plates. The Kernig sign was present on both sides, with marked rigidity of the neck. The mastoidectomy wound on the right side had been opened wide and kept open. It was felt that the meningitis was most probably an extension from the right side to the meninges, but because the left ear had been involved and because of the desperate condition of the child, a mastoidectomy was done on the left side. A small amount of pus and soft granulations were found, although the general appearance was that of resolving mastoiditis. No bony necrosis or exposures were found.

On the twenty-third day of the illness Dr. Stillerman, resident in charge, under the consulting guidance of Drs. Josephine B. Neal and William Thalhimer, started the use of convalescent scarlet fever serum intraspinally. The amounts and the time at which the serum was given are noted on the chart.

On the twenty-fourth day of the illness 5 cc. of a solution of a sulfanilamide derivative (prontosil) was given intramuscularly, and sulfanilamide was administered by mouth. Treatment with the latter drug was continued for ten consecutive days, until marked cyanosis developed; the cyanosis cleared immediately on withdrawal of the medication. The amounts given and the time of administration are noted on the chart.

The temperature showed a definite break on the twenty-fifth day. The meningeal signs, however, persisted until the thirty-third day; at that time they started to diminish, and three days later they had disappeared.

Thirteen direct transfusions of blood were given. A total of 2,040 cc. was given over eighteen days.

The table summarizes the examinations of the spinal fluid as reported from Dr. J. B. Neal's laboratory.

At no time did any of the dye in the sulfanilamide or its derivative appear in the spinal fluid, whereas it was apparent in the urine.

The patient continued to make an uneventful recovery and was discharged from the hospital on Jan. 29, 1937. At the time of writing the ears are dry, the mastoidectomy wounds are completely healed and no apparent abnormal sequelae have followed his severe illness.

COMMENT

I can only speculate as to why this child made a complete recovery. He had undergone surgical drainage of the mastoids and frequent blood transfusions and had been given convalescent scarlet fever serum both intravenously and intraspinally, and also a derivative of sulfanilamide intramuscularly and sulfanilamide by mouth.

The spinal fluid cultures were found positive for Str. haemolyticus on four consecutive days and became negative and remained so after three days of intraspinal administration of convalescent scarlet fever serum and after two days of administration of sulfanilamide. Both were given in an effort to build up immunity. The value of the serum in this case may be accounted for by the fact that this was a form of streptococcus particularly susceptible to it. The administration of serum was not followed by any reaction. While the spinal fluid remained cloudy during treatment, there was never any evidence of block.

The sulfanilamide and its derivative were given for their reported antistreptococcic properties. How much value should be accredited to their use in this case cannot be said. The use of sulfanilamide by mouth over a ten day period was associated with marked cyanosis.

A LOGICAL SURGICAL APPROACH TO THE TIP CELLS OF THE PETROUS PYRAMID

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Several approaches to the tip cells of the petrous portion of the temporal bone have been advocated. They have all required radical procedures with grave danger of injury to vital structures.

In reviewing the literature it is striking to note that most recoveries have occurred in cases in which a fistulous tract was found and the diseased cells were followed into the deeper portion of the temporal bone. In the present communication I wish to describe an approach to the cells of the extreme tip when no such fistulous tract can be demonstrated.

It is probably true that all infections of the tip do have a fistulous tract, but it cannot always be demonstrated. In the cases in which the infection in the tip is demonstrated by roentgen examination, and the clinical picture is that usually found in petrositis, there should be a means of reaching the infection without a surgical intervention which is more dangerous than the disease itself.

Usually when clinical evidence of involvement of the petrous pyramid is present, the symptoms abate after a thorough simple mastoidectomy. For this same reason, few cases of petrositis requiring surgical intervention are observed by those doing thorough mastoidectomy. But for those cases in which evidence of infection occurs after mastoidectomy, some method must be devised to effect a cure. The approach described in this paper is for those cases in which the tip cells must receive drainage.

Almour [1] and Kopetzky have described an approach which passes between the cochlea and the carotid artery. This approach drains the portion of the petrous pyramid posterior to the horizontal portion of the carotid artery. The procedure is hazardous and requires a radical mastoidectomy.

Myerson [2] described an approach for osteomyelitis of the inferior aspect of the temporal bone through the soft tissues at the base of the

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From the Department of Otolaryngology, Indiana University, and presented before the Postgraduate Class in Otolaryngology of the Indiana University School of Medicine, April 21, 1937.

1. Almour, R.: Surgical Therapy for the Relief of Suppurations of the Petrous Pyramid, Laryngoscope **41**:405 (June) 1931.

2. Myerson, M. C.; Blumberg, R., and Rubin, H. W.: A Proposed Operation for Osteomyelitis of the Inferior Aspect of the Petrous Pyramid, Arch. Otolaryng. **25**:373 (April) 1937.

skull. This portion of the temporal bone would also be drained by a posterior approach.

Should the disease involve the cells of the petrous pyramid lying anterior to the labyrinth and lateral to the point where the carotid artery makes the turn to its horizontal position, the extradural approach following radical mastoidectomy, as described by Eagleton,[3] is probably ideal.

Five of the last six infections of the petrous pyramid for which I have operated were followed along a fistulous tract inferior to the labyrinth. Consequently, I conceived the possibility of a direct approach to the cells of the tip through this region, when infection was confined to the tip cells without a demonstrable fistulous tract.

One of these cases ended fatally although the condition could probably have been cured by the present approach.

L. M., aged 12 years, came to my office on June 14, 1935. The right ear had been discharging for two months. For three weeks previous to this he had complained of right temporal headache and pain in the occipital region. For about the same length of time he had complained of deep pain in the eye. This was intermittent and was noticed more at night.

On June 10 he first noticed double vision.

On June 14 examination revealed a profuse discharge from the right ear. The temperature was 100 F. The white blood cell count was 9,000 and the red cell count was 4,000,000. There was complete paralysis of the right sixth cranial nerve. The eyegrounds were normal. Neurologic examination otherwise gave negative results. Roentgenograms showed marked cellular destruction of the right mastoid, with definite haziness extending into the tip of the petrous pyramid but with no definite break in the cortex. Immediate operation was advised.

On June 15 mastoidectomy was done on the right side. There was considerable sclerosis lateral to the antrum and in the tip of the mastoid, denoting previous infection. The lateral sinus was exposed from the knee to the jugular bulb. Inferior to the labyrinth a fistulous tract was found leading toward the tip of the petrous pyramid. At a depth of about 1 cm. considerable pus was encountered. The mastoidectomy wound was packed with iodoform gauze and left open.

On June 16 the temperature reached 102 F. The boy seemed to have little pain. His condition remained satisfactory for the next ten days. He regained use of the lateral rectus muscle to some extent but not completely.

On June 27 he complained of severe pain in the back of the head. The temperature rose to 102.4 F. Neurologic examination gave negative results. A spinal puncture was done. The fluid was under pressure. It contained 2,000 cells, with 96 per cent polymorphonuclears. The reaction to tests for globulin was 3 plus, and there was sugar in the fluid. A smear showed a diplococcus, and later a culture showed a pneumococcus.

On June 28 the temperature reached 106 F., and death occurred.

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3. Eagleton, W. P.: Unlocking of the Petrous Pyramid for Localized Bulbar (Pontile) Meningitis Secondary to Suppuration of the Petrous Apex: Report of Four Cases with Recovery in Three, Arch. Otolaryng. **13**:386 (March) 1931.

Permission for autopsy was refused, but through the mastoid wound the dura was elevated along the posterior surface of the petrous pyramid. There was erosion of bone medial to the internal auditory meatus, with an extradural collection of pus. In this case the fistulous tract was followed toward the tip cells, but a walled-off collection of pus was not reached. Death was due to fulminating generalized leptomeningitis.

An extension of the tract medially 0.5 cm. would have opened the infected cell of the tip.

Since a majority of the infections of the tip of the petrous pyramid occur during acute infection of the mastoid, a posterior approach would make a radical mastoidectomy unnecessary and thus conserve hearing and give a better final result.

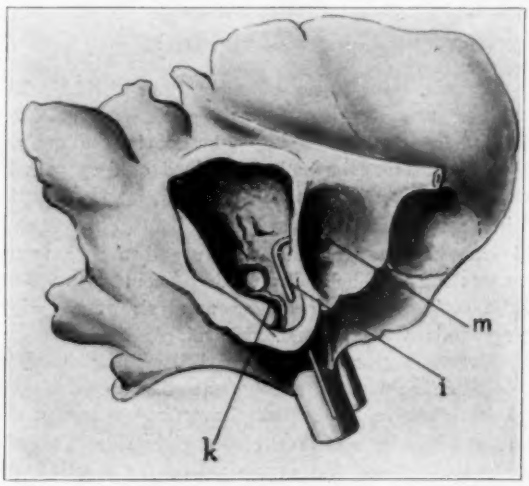

Fig. 1.—The point of entrance for operation on the tip cells of the petrous pyramid. The facial nerve is indicated as *i*, the jugular bulb as *k* and the external auditory meatus as *m*.

I shall refrain from a review of the literature regarding the physiology and the types of bone encountered and from a review of the cases which have been reported. An excellent résumé of these has already been presented.[4]

The essential thing to understand is the minute anatomic structure of the temporal bone. Thus, one is able to realize the dangers of some approaches and the possibilities of the presently described approach. The operation itself is comparatively simple. The anatomic structures endangered by the approaches heretofore described are the facial nerve,

4. Symposium on Fundamentals in Regard to Suppuration of the Petrosal Pyramid, Ann. Otol., Rhin. & Laryng. **44**:1003 (Dec.) 1935.

the cochlea and the carotid artery. When an external approach is attempted, it is impossible to reach the cells of the tip without tearing the dura.

After dissecting twenty temporal bones with a dental bur, I found that the cells of the tip invariably lie posterior and superior to the horizontal portion of the carotid artery. Ten more bones were sectioned through the carotid canal, and all showed the artery to be flush with the cortex of the anterior surface of the petrous bone (fig. 5). Even when nonpneumatized bones were sectioned there was ample room posterior to the horizontal portion of the carotid artery to permit the entrance

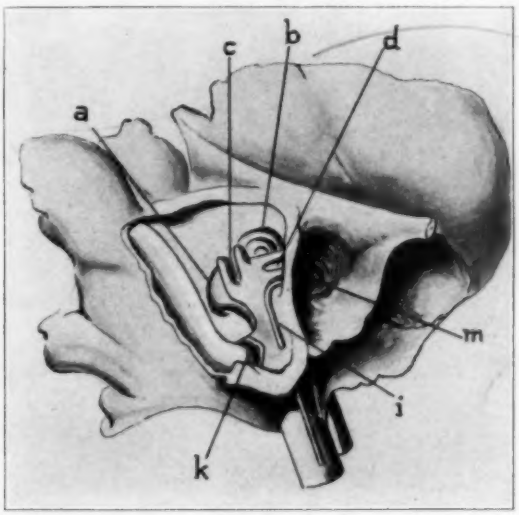

Fig. 2.—A more complete dissection at the point of entrance for operation. The internal auditory meatus is indicated as *a*, the superior semicircular canal as *b*, the posterior semicircular canal as *c*, the horizontal semicircular canal as *d*, the facial nerve as *i*, the jugular bulb as *k* and the external auditory meatus as *m*.

of the bur. There was 4 to 6 mm. of bone posterior to the carotid artery in every instance. This being the case, a sane approach appears to be along the posterior portion of the bone.

The procedure itself requires the completion of a thorough simple mastoidectomy. The ridge representing the course of the facial nerve must be outlined. It is well to expose the lateral sinus and to follow it until the dome of the jugular bulb is exposed. The instruments usually employed for operation on the mastoid may be used. The entrance to the tip cells then is made by directing the 1.5 mm. bur as shown in the diagrams at an angle of 10 degrees anteriorly and 5 degrees superiorly. A size 0 or 00 curet may be used instead of the bur. The entrance of

the bur is medial to the facial nerve; so there is no danger of injuring it. The shaft of the curet or bur should hug the dome of the jugular bulb. Figure 1 illustrates the point of entrance. This point is inferior to the posterior semicircular canal, and there is no danger of injuring it.

Figure 2 shows a more complete dissection at the point of entrance. This reveals that one is not endangering the vestibule and that one has ample room inferior to the auditory nerve.

The curet or bur then should hug the posterior wall of the petrous bone. Should the dura be exposed, it can be sensed by feel, and the instrument can be directed slightly more anteriorly.

Figure 3 illustrates the internal aspect of the petrous pyramid after the cortex over the line of approach has been removed. This does not

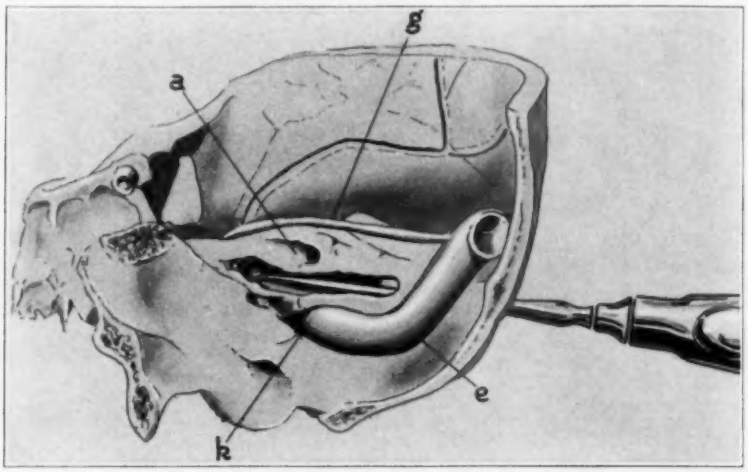

Fig. 3.—The internal aspect of the petrous pyramid after the removal of the cortex over the line of approach. The internal auditory meatus is indicated as *a*, the lateral sinus as *e*, the superior petrosal sinus as *g* and the jugular bulb as *k*.

remove the entire tip but gives drainage to any cells present. As noted here, the bur enters the tip cells from 1 to 1.5 cm. medial to the dome of the jugular bulb.

The tip of the petrous pyramid then has been entered with ample room anteriorly to prevent injury to the vestibule or to the carotid artery. There is little danger to the auditory nerve, which lies superiorly, as shown in figure 4. In this illustration a more complete dissection is seen of the line of approach from the posterior aspect of the petrous pyramid.

When the section shown in figure 4 is viewed from the superior aspect (fig. 5), it can be clearly seen that any attempt to reach the cells of the tip from the anterior aspect endangers most of the structures of the inner ear. It illustrates that there is ample room posterior to the

vestibule and posterior to the carotid artery. It also reveals the absence of more than the bony cortex anterior to the horizontal portion of the carotid artery.

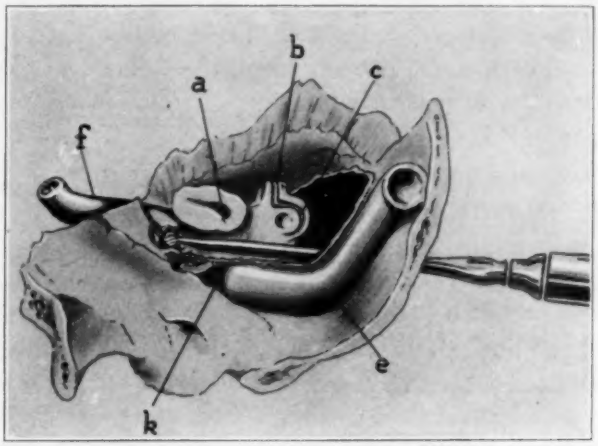

Fig. 4.—A more complete dissection than that shown in figure 3. The internal auditory meatus is indicated by *a*, the superior semicircular canal by *b*, the posterior semicircular canal by *c*, the lateral sinus by *e*, the internal carotid artery by *f* and the jugular bulb by *k*.

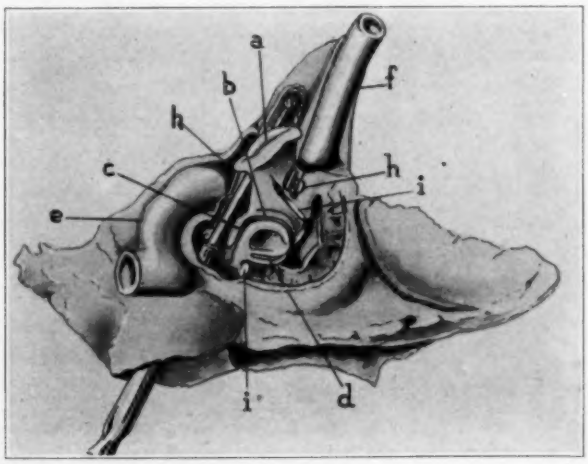

Fig. 5.—The section shown in figure 4 viewed from the superior aspect. The anterior auditory meatus is indicated by *a*, the superior semicircular canal by *b*, the posterior semicircular canal by *c*, the horizontal semicircular canal by *d*, the lateral sinus by *e*, the internal carotid artery by *f*, the cochlea by *h*, the facial nerve by *i* and the jugular bulb by *k*.

The advantages of the present method of approach to the tip cells are:

1. Simplicity of the procedure.
2. Avoidance of radical mastoidectomy.
3. Conservation of hearing.
4. Avoidance of injury to the facial nerve, cochlea and labyrinth.
5. An approach to the tip cells parallel to the carotid artery, which reduces the danger of perforation.

The dangers are:

1. Injury to the jugular bulb.
2. Injury to the auditory nerve.

When the mastoid cavity is small, with the lateral sinus extremely close to the posterior canal wall, this approach cannot be used.

I present this as a preliminary report from the study of anatomic material and shall justify the procedure by future clinical results.

915 Hume Mansur Building.

GLOSSOPHARYNGEAL NEURALGIA ASSOCIATED WITH ABSCESS OF THE PETROUS TIP FOLLOWING MASTOIDITIS

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NEW YORK

Owing to the intimate relationship between the ninth, tenth and eleventh cranial nerves as they emerge through the jugular foramen, trauma or disease in this region may affect one or all of these nerves and produce symptoms somewhat remote from their point of origin. These three nerves, the glossopharyngeal, the vagus and the spinal accessory, pass through the anterior portion of the jugular foramen, the anterior border of which is formed by the petrous pyramid at this point. The glossopharyngeal nerve lies closest to the petrous tip and is here separated from the vagus and the spinal accessory nerve by a strip of dura mater.

Injury to these nerves may come from fracture of the base of the skull, from syphilitic meningitis, from tumor of the brain in the region of the jugular foramen or from one of various other pathologic conditions. Disturbance of all three nerves may produce the condition known as Vernet's syndrome, or the syndrome of the jugular foramen (*syndrome du trou déchiré postérieur*). It may be marked by difficulty in swallowing, anesthesia or hyperesthesia of the soft palate and the pharynx, loss of taste in the posterior part of the tongue (glossopharyngeal nerve), paralysis of the vocal cord on the affected side (vagus nerve) or disturbance of the function of the sternocleidomastoid and trapezius muscles (spinal accessory nerve).

This syndrome has been observed by Azemar [1] in two cases, resulting from metastatic tumor of the petrous tip. It has also been found in association with inflammatory processes around the jugular foramen, such as thrombosis of the bulb of the jugular vein.

An incomplete syndrome may be present if only one nerve is involved. Wreden [2] observed spasms of the sternomastoid and trapezius muscles in thrombosis of the transverse sinus which he attributed to irritation

1. Azemar: Deux cas de syndrome condylo-déchiré postérieur par metastase osseuse, Rev. de laryng. **52**:1039, 1924.

2. Wreden, R.: Analyse eines bemerkenswerten Falles von Phlebitis sinuum durae matris ex otitide, Arch. f. Augen.- u. Ohrenh. **3**:97, 1871.

of the spinal accessory nerve. Beck [3] described paralysis of the vagus nerve with immobility of the vocal cord on the diseased side caused by thrombosis of the jugular bulb. Kümmel [4] reported cases of glossopharyngeal neuralgia resulting from thrombosis of the jugular bulb. He attributed these symptoms to compression of the glossopharyngeal nerve in its passage through the jugular foramen. Figures 1, 2 and 3 show the jugular foramen with its anatomic relations to the glossopharyngeal,

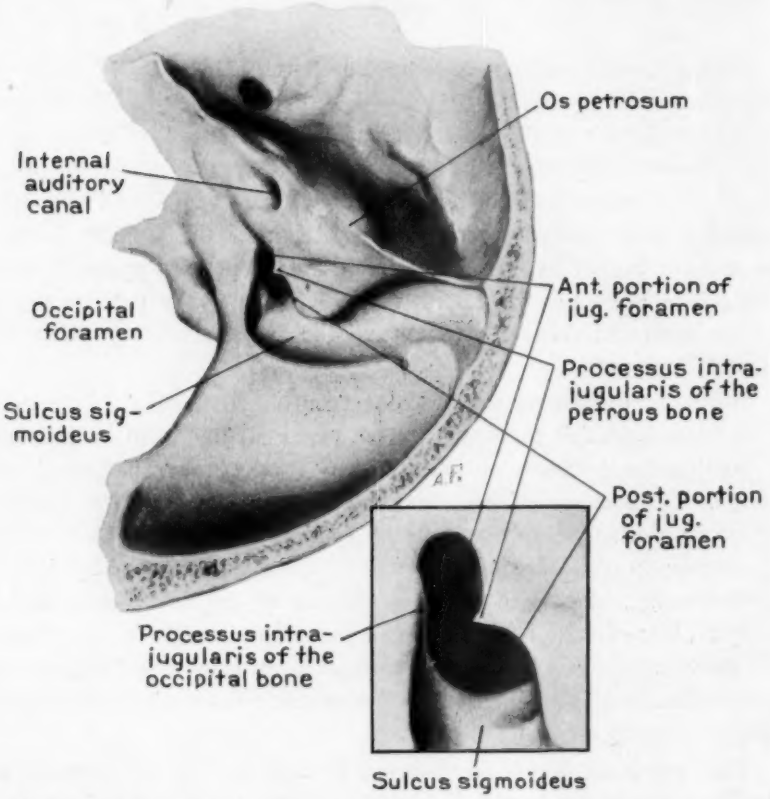

Fig. 1.—The right jugular foramen with its anatomic relations to the temporal and occipital bones. The sketch at the bottom shows the foramen with its anterior and posterior portion.

vagus and spinal accessory nerves and the lateral sinus. The antero-lateral border of the foramen (incisura jugularis of the temporal bone

3. Beck, B.: Thrombose des Sinus transversus dexter und der Vena jugularis mit Laehmung des Nervus vagus in Folge einer rechtsseitigen Otitis interna, Deutsche Klin. **15**:470, 1863.

4. Kümmel, W.: Ueber die vom Ohr ausgehenden septischen Allgemeinerkrankungen, Mitt. a. d. Grenzgeb. d. Med. u. Chir., supp. 3, 1907, p. 208.

[figure 3]) shows the processus intrajugularis (figs. 1 and 3) which corresponds with a similar formation at the posterior border of the foramen, the processus intrajugularis of the occipital bone (fig. 1). The processes are connected by a fibrous band, the ligamentum petrosa-occipitale (fig. 2). Dissections on the cadaver reveal that this ligament is much thicker and stronger than it is usually shown to be in anatomic textbooks. It divides the jugular foramen into an anterior and a posterior portion (figs. 1 and 2). The anterior portion serves as a passage for the glossopharyngeal, vagus and spinal accessory nerves (fig. 2)

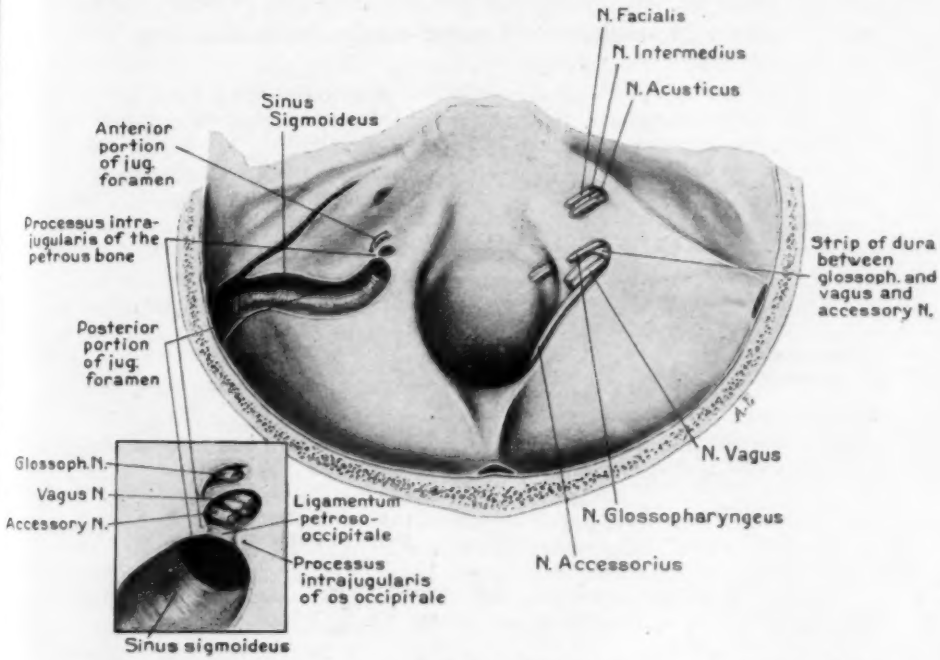

Fig. 2.—The posterior part of the skull showing the jugular foramen with its anatomic relations to the glossopharyngeal, vagus and spinal accessory nerves and the lateral sinus. The ligamentum petroso-occipitale divides the foramen into an anterior (passage for the ninth, tenth and eleventh cranial nerves and the sinus petrosus inferior) and a posterior portion (for the lateral sinus).

and the lower part of the sinus petrosus inferior. The posterior part of the foramen receives the lateral sinus as it dips downward to form the jugular bulb. The glossopharyngeal nerve is separated from the vagus and the spinal accessory nerve by a thin strip of dura mater (fig. 2).

While pain in and around the eye is described as one of the symptoms in suppuration of the petrous tip, there is little in the literature concerning involvement of the glossopharyngeal, vagus and spinal acces-

sory nerves in connection with this disease. Inflammatory changes in the petrous tip, especially when there is extensive abscess formation, may, however, extend into the jugular foramen and affect one or all three of the nerves passing through it.

The glossopharyngeal nerve, lying as it does closer to the bony structure of the petrous tip than the other two nerves (fig. 2) and separated from them by part of the dura mater, is most likely to be affected and to show symptoms of irritation, or even paralysis, before the vagus or the spinal accessory nerves have become involved. That the cells of the petrous tip may actually extend into the immediate neighborhood of the glossopharyngeal nerve can be demonstrated on gross

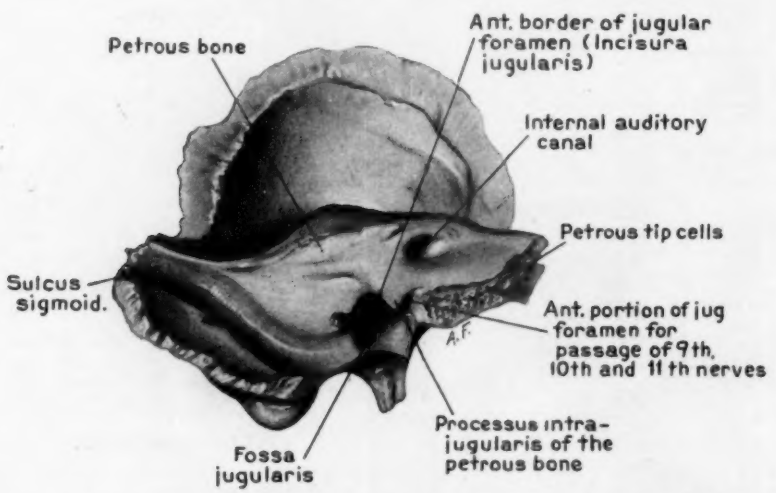
Petrous bone
Ant. border of jugular foramen (Incisura jugularis)
Internal auditory canal
Petrous tip cells
Sulcus sigmoid.
A.F.
Ant. portion of jug foramen for passage of 9th, 10th and 11th nerves
Processus intra-jugularis of the petrous bone
Fossa jugularis

Fig. 3.—The petrous portion of the temporal bone. The occipital bone has been removed to show the cells of the petrous tip.

anatomic specimens (fig. 3). In nonpneumatized bone, isolated cells may be found near the jugular foramen. Guild [5] described a single anatomic specimen as follows:

> In an otherwise nonpneumatized petrous pyramid there is a small pneumatic cell in that part of the bone near the glossopharyngeal and vagus nerves. By careful probing, it can be determined that this cell is an extension from the hypotympanum, also that this cell has a constricted "neck." In case of infection with occlusion of its natural drainage route, the logical symptoms expected would have been those associated with disturbed function of the near by nerves.

While this may be the logical expectation in cases of abscess of the petrous tip, only a limited number of such instances can be found in

5. Guild, S. R.: Symposium on Suppuration of the Petrosal Pyramid, Ann. Otol., Rhin. & Laryng. **44**:1020 (Dec.) 1935.

the otolaryngologic literature. In these cases all three of the nerves were paralyzed simultaneously.[6] I have been able to find no previous record of isolated neuralgia of the glossopharyngeal nerve associated with suppuration of the petrous tip. As a patient showing such symptoms came under my observation, it seems desirable to report the case in full:

P. C., a white girl aged 19, was admitted to the hospital on May 24, 1936. A simple mastoidectomy on the left side was performed on May 27 and a simple mastoidectomy on the right side on June 8. She was discharged on June 21 for after-treatment in the dispensary.

On July 14 the patient suddenly felt pain in the right ear and her temperature rose to 103 F. She was readmitted to the hospital on July 15. On admission, she complained of slight pain around the right eye and in the lower teeth. Examination showed the left mastoid wound healing well with no discharge from the canal of of the ear. There was, however, a profuse thick purulent discharge from the mastoid wound and the canal of the ear on the right side. General, neurologic and dental examination gave negative results. Roentgenologic examination showed no abscess formation in the petrous tip, and on July 18 revision of the right mastoidectomy cavity was done. When the wound was opened, the dura, which had been exposed at the first operation, was found to be covered with thick granulations. There was extensive necrosis of the posterior bony wall of the canal of the ear. The facial nerve appeared to be exposed for about ¼ inch (0.6 cm.) and embedded in granulation tissue. All diseased cells were thoroughly curetted, and the wound was left open. On July 24 the postauricular wound was closed. The pain around the eye had almost entirely subsided.

Despite this operation, discharge from the right middle ear reappeared and increased to such an extent that the wound was reopened and drained on August 1. After this the discharge gradually diminished, and the patient was sent home on September 3.

One week later, the patient was readmitted, complaining of severe pain in the right eye and the lower teeth. She had also suffered pain in the right side of her throat for the past week. This pain was continuous, increased at times simultaneously with the pain in the eye and teeth and was somewhat accentuated by swallowing. In the last three days it had become severe and seemed to penetrate into the nasopharynx.

Examination showed the postauricular wound almost entirely closed. There was a considerable amount of thick purulent discharge from the canal of the ear. The pharynx, nasopharynx and larynx showed no pathologic involvement. There was no inflammation or swelling of the cervical glands. The areas around the right tonsil and the anterior and posterior pillars and the posterior wall of the pharynx just behind the posterior pillar on the right side were extremely tender to touch.

On September 12 exploration of the mastoid cavity was done. A small fistula was discovered above and posterior to the lateral semicircular canal, through which

6. Bertoin, R.: Syndrome du trou déchiré postérieur consécutif à une otorrhée chronique, Soc. d'oto-rhino-laryng. de Lyon, 1935, pp. 89-92; Ann. d'oto-laryng., 1936, pp. 212-215. Ramadier, J.: Zentralbl. f. Hals-, Nasen- u. Ohrenh. **23**:766, 1934. Alonso, J. M.: Síndrome de la punta del peñasco, An. de oto-rino-laring. d. Uruguay **2**:15, 1932.

a fine probe could be introduced into the petrous tip for about 1½ inches (3.8 cm.). Enlargement of the fistula with a curet revealed a large abscess cavity in the petrous tip. Further exposure of the dura showed a small epidural abscess, with necrosis of the bony surface of the pyramid. This necrotic bone was removed with curets and rongeurs, and about 5 cc. of thick creamy pus under pressure was evacuated from the depth of the petrous tip.

One day after this operation the pain around the eye and teeth and in the throat had disappeared. Paralysis, resulting from the operation and involving all three branches of the facial nerve, has markedly improved at the time of writing. There is no discharge from the ear and only occasionally the patient notices a headache on the side operated on.

SUMMARY

A case of neuralgia of the glossopharyngeal nerve giving rise to symptoms in the pharynx is reported. The pain cleared up almost immediately on drainage of an abscess of the petrous tip.

Instances of simultaneous disturbance of the glossopharyngeal, vagus and spinal accessory nerves, known as Vernet's syndrome, are cited. The syndrome may result from fracture of the skull, tumor of the brain, syphilitic meningitis, abscess or tumor of the petrous tip, thrombosis of the bulb of the jugular vein or any inflammatory process in the region of the jugular foramen. Involvement of obscure etiology in the soft palate, the vocal cords or the sternomastoid or the trapezius muscle may therefore be found to originate in trauma or disease of the area adjacent to the jugular foramen or in a pathologic condition of the petrous tip.

IRRADIATION FOR INFECTION IN OTOLARYNGOLOGY

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EVANSTON, ILL.

Much has been written in the past thirteen years on irradiation therapy of infections, yet little has appeared in the literature of otolaryngology. In some hospitals such treatment is almost routine, but some physicians have had no experience with it. Even some radiologists are skeptical of its value, though most writers are enthusiastic. Most recent reports agree that with a fairly uniform technic and with small dosage irradiation is an important adjunct to other forms of treatment and for some types of infection of the ear and throat may even supplant the accepted measures.

One author [1] stated that over four hundred diseases are benefited by irradiation, and there have been reports of cures of as widely differing conditions as arthritis, meningitis, pelvic peritonitis and bronchiectasis.[2]

One may question some of the reports concerning the value of irradiation, as it is easy on the one hand to color the picture in accorddance with one's preconceptions and difficult on the other to collect objectively convincing data in self-limited conditions. Analysis of my own statistics does not fully verify the favorable impression given by clinical observation over a period of several years; yet I cannot help being frequently struck by the favorable course of the condition in individual cases. To see rapidly spreading angry cellulitis abruptly halt its march toward the dangerous region of the angular vein after one roentgen treatment, to see acute adenitis resist all the usual measures and then rapidly melt away after irradiation or to note the quick change in outlook and spirit of a seriously septic patient within from eighteen to forty hours after roentgen therapy is more convincing than a table of statistics. A true judgment, however, is probably to be derived from statistics.

From the Northwestern University Medical School and the Cook County Hospital.

Read at the Forty-Third Annual Meeting of the American Laryngological, Rhinological and Otological Society, Inc., Atlantic City, N. J., June 4, 1937.

1. Elward, J. F.: Radiation Therapy, Radiology **26**:86-98 (Jan.) 1936.

2. Berck, M., and Harris, W.: Roentgen Therapy for Bronchiectasis, J. A. M. A. **108**:517-522 (Feb. 13) 1937.

Heidenhain and Fried [3] in their early important contributions reported the use of irradition therapy in over 1,500 types of infection with good results in about 75 per cent of the cases. These included 95 per cent of the cases of furuncle of the sweat glands; 80 to 85 per cent of the cases of other types of furuncle lymphangitis, alveolar abscess and angina; 70 per cent of the cases of erysipelas, felon and lymphadenitis; 60 per cent of the cases of suppuration of the parotid glands, and 28 per cent of the cases of otitis media. Schenck,[4] from a combined series of 355 cases of acute adenitis, found that in 85 per cent the condition terminated in resolution, as compared with only 38 per cent in which an abscess did not form with the usual treatment, as reported by Holt and Howland.

May [5] reported good results in 81 per cent of 235 cases of disease of various types, including benefit in 12 of 14 cases of sinusitis and 14 of 16 cases of tonsillitis.

Desjardins [6] called attention to the widely recognized good effect of irradiation on tuberculous adenitis and expressed the belief that it can give much relief in tuberculous laryngitis, especially in the infiltrative stage.

Roberts [7] said of acute otitis media with mastoiditis that one is impressed by the frequent and dramatic clinical improvement following the taking of the roentgenogram. In 8 of 11 cases he saw a definite relation between exposure and improvement. Both Granger and Schillinger [8] emphasized such an effect; yet it is hard to see how the amount of radiation used in making roentgenograms, which is only a small fraction of that usually employed for treatment, could produce such results. Fried stated that his results were good in 28 per cent of cases in which the full therapeutic dose was given, and Crain and Sloan [9] felt that their results in 20 cases of mastoiditis in infants were markedly

3. Fried, C.: Roentgen Treatment of Acute Infection, Strahlentherapie **26**: 484-507, 1927.

4. Schenck, S. G.: Roentgen Therapy for Acute Cervical Adenitis, Am. J. Dis. Child. **49**:1472-1486 (June) 1935.

5. May, E. A.: Roentgen Therapy in Acute Inflammatory Conditions, Radiology **14**:411-415 (April) 1930.

6. Desjardins, A. U.: Action of Roentgen Rays on Tuberculous Processes, Wisconsin M. J. **34**:719-730 (Oct.) 1935.

7. Roberts, M. H.: A Study of Mastoid Infection in Children, South. M. J. **29**:1207-1213 (Dec.) 1936.

8. Schillinger, R.: The Apparent Therapeutic Effect of the Roentgen Ray upon the Clinical Course of Acute Mastoiditis, Radiology **18**:763-776 (April) 1932.

9. Crain, C. F., and Sloan, J. M.: Infant Mastoiditis: Its Management with Particular Reference to X-Ray Diagnostic and Therapeutic Possibilities, Texas State J. Med. **32**:388-397 (Oct.) 1936.

bettered by roentgen therapy. Daniel [10] expressed the belief that with irradiation in acute otitis in the first twenty-four hours resorption usually occurs but that later irradiation is dangerous unless surgical drainage is provided. He stated that the same holds true in acute sinusitis.

Webster [11] said that preliminary irradiation of infected malignant growths is important for the control of sepsis as a preliminary for further measures. Ayres, Anderson and Foster [12] expressed the belief that surgical intervention for carbuncle should give way to medical treatment with roentgen rays, and there are many favorable reports of treatment with roentgen rays for this condition. Many other authors have given similar reports on a wide variety of conditions.

Excellent general reviews of the literature have been written by Desjardins in 1931,[13] Schenck in 1935 [4] and others, so that it is not necessary to review the history of the treatment. The theories of action of the rays are naturally numerous, since little is finally known about their effects on living tissue and the diverse reactions of the organism to them. Even in regard to malignant diseases on which so much work has been done, there is little understanding of the biologic effect of hard rays, and it is realized that many reactions are concerned besides a simple necrobiotic action on the cell. Of course, in the field under discussion the dose is only a fraction of that used in cancer and probably the process is quite different, although some authors hold that all effects of gamma rays are due to their destructive action, not to stimulation, and the organism's reaction to that destruction.

Leukocytic destruction with freeing of enzymes seems to be most important. Heinke showed that the sensitive white cells are destroyed, that their fragments are taken up by the reticulo-endothelial cells which are stimulated to phagocytosis and that later these phagocytes disappear. Warthin [14] demonstrated that within fifteen minutes of the use of roentgen rays lymphocytic disintegration may begin. Desjardins [13] expressed the belief that inflammatory lesions respond in proportion

10. Daniel, M. Gaston: Roentgenotherapy of Inflammatory Infection in Oto-Rhino-Laryngology, Bull. et mém. Soc. de radiol. méd. de France **225**:113-122 (Jan.) 1936.

11. Webster, J. H.: Radiations in the Treatment of Inflammations, Brit. M. J. **2**:310 (Aug. 13); 665-667 (Oct. 8) 1932.

12. Ayres, S., Jr.; Anderson, N. P., and Foster, P. D.: Dermatologic Versus Surgical Treatment of Carbuncles and Furuncles, J. A. M. A. **108**:858-860 (March 13) 1937.

13. Desjardins, A. U.: Radiotherapy for Inflammatory Conditions, J. A. M. A. **96**:401-408 (Feb. 7) 1931.

14. Warthin, A. S.: An Experimental Study of the Effects of Roentgen Rays upon the Blood-Forming Organs, with Special Reference to the Treatment of Leukemia, Internat. Clin. **4**:243-277, 1906.

to the degree of leukocytic infiltration and the rays act primarily by destroying these cells, freeing ferments and stimulating autolysis and phagocytosis. The rapid response in some cases could also indicate this to be the primary factor, as only the white cells could be affected by such small doses in the short time in which improvement may occur.

Protein shock is probably a factor of some importance, though Fried argued that the effect from such small doses should be negligible. This, however, could explain the local stimulation of phagocytosis, the favorable effect of roentgen rays applied elsewhere than to the affected part and the general subjective improvement, which May pointed out can occur even before local changes are noted.

The effect on bacteria is interesting. Except on certain organisms in thin layers with rather large doses, gamma rays seem to have little effect on bacteria in vitro. Yet various authors have found that an area of infection or abscess treated seems to be sterilized in the majority of cases. According to Webster and others, serum from a treated person also has increased bactericidal power, as does pus aspirated from a sterile abscess after irradiation.

Debasi demonstrated an increase in leukocytosis, phagocytosis and nuclear fragmentation within twelve hours after irradiation and a diminution of the infiltration after another twelve hours. He found the blood vessels dilated, with increased flow of blood and secretion of lymph.

Webster expressed the belief not only that there is a direct bactericidal action on the infecting organisms but that other changes occur, similar to inflammation, with engorgement of the blood and lymph channels and diapedesis. He expressed the belief that damage to the tissues leads to protein shock and also that there is reactive regeneration, as shown by the proliferation of fibroblasts. In other words, the results shown are those of normal inflammation, but as Schenck points out, with a markedly heightened tempo and augmented effectiveness. In cases in which the condition is favorable after a possible preliminary increase of congestion and discomfort, the process usually regresses without suppuration and with rapid improvement in local and general symptoms, often in from twenty-four to forty-eight hours. If pus forms, localization is much more rapid, and after drainage healing is likely to be unusually rapid.

Of course, the results are not always favorable, especially in patients not treated early.

In cases of more chronic involvement the mechanism may differ somewhat. The dose required may be much greater, even approaching that for malignant growths, and treatment may have to be carried over

a longer period. This is true in conditions in which there is considerable fibrosis, such as fibrocaseous tuberculosis, actinomycosis and blastomycosis.

Another effect is actual destruction of the tissue which harbors the infection. The successful treatment of acne is believed by some radiologists to depend on destruction of the sebaceous glands of the treated area and some of the reported favorable effects in chronic inflammation of the throat may depend on at least partial obliteration of lymphoid elements. The curative effect of roentgen rays after radical mastoidectomy reported by Ersner and Weiner [15] is probably due to limitation of the overgrowth of granulations and fibroconnective tissue.

The dose advocated by most authors is small, varying from 10 to 30 per cent of an erythema dose, and the smaller dose, repeated if necessary, is growing in favor. From 85 to 140 kilovolts or less, often up to 200 kilovolts, is used with from 1 to 5 mm. of aluminum or 0.5 mm. of copper at a skin distance of 30 to 50 cm., with amperage and time to give from 75 to 240 roentgens measured in air without back scattering. The cases I cite from the records of the Evanston Hospital and the Cook County Hospital were at these two extremes of dosage.

In from seven to ten hours after such treatment there may occur increased congestion, edema and pain. With excessive treatment this is pronounced. After that in favorable cases improvement soon follows. The treatments may need to be repeated at intervals of two or three days. Occasionally there may be—as I have seen in erysipelas—a favorable first response, with remission of fever and other symptoms, and later exacerbations and at times a more stubborn but less virulent infection. This is probably because some of the infected area is not covered by the first treatment. Schenck found much better results in cervical adenitis when the whole neck was treated than when the treatment was limited to the most obvious glands.

Desjardins and Schenck stated that even if in a minority of cases the condition fails to respond favorably, they have at least not seen any bad results. I am not so sure. Two cases suggest this possibility.

Case 1.—Mrs. J. had unlocalized vestibulitis for eight days, when induration and redness developed over the nose, going up to within 1.5 cm. of the left internal canthus. She was given roentgen therapy of 100 roentgens with 4 mm. of aluminum at a skin distance of 18 cm. Five hours later a sedative was required for relief of pain. The next morning the redness over the nose and the infiltration were less, and they rapidly subsided in two days. By that time, however, the septum was greatly thickened, and the next day an abscess was opened. Considerable

15. Ersner, M. S., and Weiner, L. H.: Roentgenotherapy in Otorrhea Following Radical Mastoidectomy, M. Rec. **140**:588-591 (Dec. 5) 1934.

cartilage was destroyed, and an unpleasant cosmetic defect was left. From the appearance of the septum and the location of the cellulitis I felt that with ordinary treatment septal abscess would have been unlikely.

CASE 2.—M. P. was operated on for staphylococcic mastoiditis three weeks after fracture through the tegmen antri. She did well for two weeks, but she had a temperature up to 101 F., and some induration developed at the tip of the mastoid. One hundred and twenty-four roentgens were given at noon; by night there was marked spread and increase of swelling. The temperature rose to 103 F. and over during a subsequent stormy course of two weeks when a large phlegmon of the neck localized and was drained.

Cassuto and Hayat[16] reported two cases of disseminated tuberculosis after swelling of the treated glands had subsided, which they thought to be the result of treatment. Webster insisted that as the tubercle is a defense mechanism great care should be taken not to destroy it by irradiation. Kadranka and Bardet[17] reported that in 43 per cent of 42 cases of malignant disease of the larynx and neck active pulmonary tuberculosis developed as a result of treatment. The

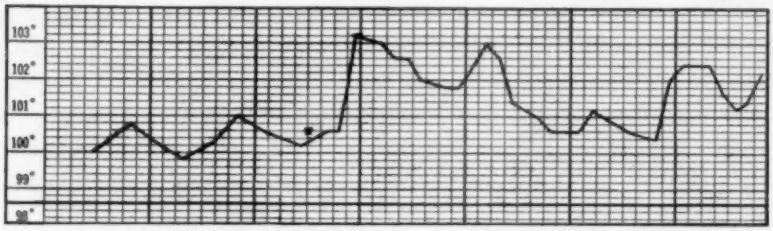

Chart 1.—Postoperative temperature curve for a patient (M. P.) with traumatic mastoiditis. Roentgen therapy was given at the point indicated by the star.

large doses used for malignant disease hardly make this comparable to proper therapy for infection, but this does not warn against excessive treatment.

Over a period of some five years irradiation has seemed to me to be of great value in acute infection, and this work was undertaken to demonstrate that objectively. Analysis of the records does not seem to bear out completely the previous good impressions. Only about two thirds of the patients treated are suitable for consideration in this report. Many in the outpatient department did not return after a

16. Cassuto, E., and Hayat, L. E.: Adénopathies et radiothérapie, Rev. tunisienne d. sc. med. **21**:213-215 (July-Aug.) 1927.

17. Kadranka, S., and Bardet, P.: Acute Pulmonary Tuberculosis Following Radio-Therapy of Pharyngo-Laryngeal Cancer, J. de radiol. et d'électrol. **20**:24-31 (Jan.) 1936; cited by Waters, C. A.: Year Book of Radiology, Chicago, The Year Book Publishers, Inc., 1936.

single roentgen treatment. Presumably, most of these were cured, but that cannot be concluded for statistical purposes. In many cases interns and clinicians considered roentgen therapy of no importance and made no note of its effect, though temperature curves and nurses' reports were of some value. A pediatrician's note stating that "glands that had been at a standstill before exposure to roentgen rays melted away rapidly thereafter" was significant, but all too few made such notations.

It seemed to me that suppurative parotitis could furnish the best objective study, but this small series offers a surprise. Rankin and Palmer's [18] statement that from 36 to 60 per cent of patients with suppurative parotitis die is often quoted, and Greene's [19] statistics indicated that before irradiation treatment was used 58 per cent of the cases ended fatally.

The result of suppurative parotitis is often inseparable from that of the usually grave general condition of which it is a complication. Better attention to oral hygiene and care of the water balance by parenteral administration of fluids have perhaps lessened its incidence and its seriousness, though good results, like those in 18 of the 20 cases reported by Rankin and Palmer, have been commonly ascribed to the use of irradiation. In the series of 16 patients from the Evanston Hospital and the Cook County Hospital treated by radium and roentgen rays, only 2 died; 1 of these was found moribund in a lodging house and the other had an inoperable carcinoma of the ovary in the terminal stage.

The tabulated results (table 1) indicate that the effect of irradiation was marked in 56 per cent, fair in 6 per cent, slight in 12 per cent and lacking in 18 per cent. These statistics seemed to be favorable until I examined separately those concerning the patients from the Cook County Hospital (table 2). No patients from medical or surgical wards were included, but only those who came to the otolaryngologic clinic without any grave disease, with the one exception. Their conditions might be called "primary," and the pictures, it seems to me, should indicate the real seriousness of parotitis per se. Eliminating the one patient who was moribund when he was first examined, all recovered with no stormy course. Seven were treated with irradiation, and 4 of these had external drainage, as compared with 6 of the 7 who had no irradiation, and they had definitely a more rapid recovery. Their generally low temperatures made this no basis for judgment. These

18. Rankin, F. W., and Palmer, B. M.: Post-Operative Parotitis: Treatment With and Without Radium, Ann. Surg. **92**:1007-1013 (Dec.) 1930.

19. Greene, cited by Decker, F. H.: Radium Treatment of Secondary Parotitis, Illinois M. J. **71**:319-322 (April) 1937.

patients perhaps had unusually mild involvement, but their cases indicate the difficulty of studying such infection statistically and drawing too sweeping conclusions.

In the whole group the most striking effect was shown in the dangerous condition of cellulitis of the upper lip and nose (table 1). In the 2 fatal cases thrombosis of the cavernous sinus developed, and that

TABLE 1.—*Conditions Treated by Irradiation*

Diagnosis	No. of Cases	Improvement				Death
		None	Slight	Fair	Marked	
Cellulitis (upper lip and nose)	18	11%	....	10%	72%	11%
Other cellulitis of head and neck	22	9%	18%	41%	32%	
Carbuncle	5	....	20%	40%	40%	
Alveolar abscess	6	16%	16%	33%	33%	
Erysipelas	2	1	....	....	1	
Cellulitis (postmastoid)	3	2	....	....	1	
Ludwig's angina	3	1	....	1	1	
Acute adenitis	22	13%	13%	22%	55%	
Tuberculous adenitis	12	25%	....	67%	8%	
Tuberculosis of tongue	1	....	....	....	1	
Tuberculosis of nose	1	....	....	....	1	
Tuberculosis of trachea	1	....	....	....	1	1
Suppurative parotitis	16	18%	12%	6%	56%	12%
Total	112					

TABLE 2.—*Suppurative Parotitis (Primary)*

Patient	Etiology	Treatment	Suppuration	Result
M. P.	Cold	Roentgen rays	Rupture	Fair recovery
A. C.	Idiopathic	Roentgen rays	.....	Rapid recovery
G. J.	Idiopathic	Roentgen rays	.....	Rapid recovery
F. O'G.	Idiopathic	Roentgen rays	Incised	Slow recovery
H. C.	Otitis	Roentgen rays	Incised	Rapid recovery
J. C.	Dental	Roentgen rays	Incised	Slow recovery
A. H.	?	Roentgen rays	.....	Rapid recovery
R. O.	Blow	.....	Incised	Well in 4 days
H. F.	Furuncle	.....	.....	Slow recovery
J. P.	Found in coma	.....	Incised	Death in 48 hours
A. K.	Chilling	.....	Incised	Rapid recovery after incision
W. W.	Dental	.....	Incised	Rapid recovery after incision
D. S.	?	.....	Incised	Rapid recovery after incision
S. L.	?	.....	Incised	Slow recovery

had probably occurred by the time irradiation was begun. The clinical course of many of these angry swellings of this region with the threatening extension toward the angular vein is more striking after roentgen therapy than the statistics showing marked improvement in 72 per cent of the cases would indicate. One diabetic patient who had cellulitis of the whole upper half of the face (not erysipelas), with the eyes swollen

shut and chemosis of the bulb and proptosis of one eye to suggest thrombosis of the cavernous sinus, showed striking amelioration within twenty-four hours after the first roentgen treatment and recovered.

One patient with mononucleosis (chart 2) had 48 per cent of monocytes, a positive reaction to the Forsmann test with a 1:5,000 dilution and ulceration of tonsil fragments and lateral bands. After temporary improvement on the thirteenth day, he became much worse, the epiglottis and the soft tissues of the arytenoid region were considerably swollen, pain made swallowing almost impossible and he appeared very ill. Some improvement occurred after the administration of one-fourth erythema dose of roentgen rays, and almost complete immediate relief from

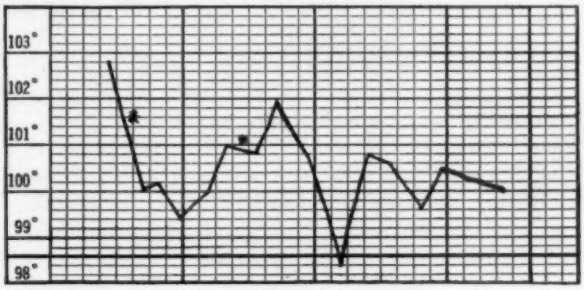

Chart 2.—Temperature curve for a patient (J. M.) with mononucleosis. There were 20,600 white blood cells, with 48 per cent mononuclears and 24 per cent polymorphonuclears. The Forsmann reaction with a 1:5,000 dilution was positive. Roentgen therapy was administered at the points indicated by the stars.

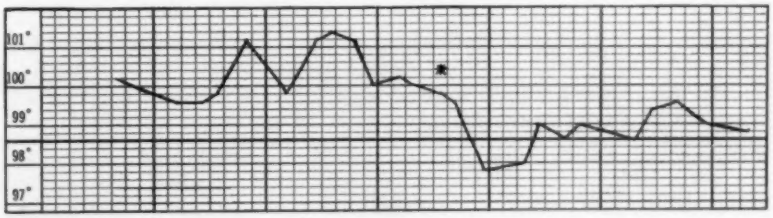

Chart 3.—Temperature curve for a patient with cervical adenitis. The post-treatment curve is typical. Roentgen therapy was administered at the point indicated by the star.

fever, pain and the local pathologic condition followed a second treatment two days later. In this, as in other cases, I cannot be too sure what would have been the result without roentgen rays.

Although one may not subscribe to all the good effects claimed for irradiation in combating infections, it seems safe to conclude that it is without much danger in small dosage and that it is of considerable value when properly used.

Clinical Notes

AN IMPROVED TONSIL SUTURE NEEDLE

MEYER L. NIEDELMAN, M.D., PHILADELPHIA

The needle presented here is a modification of one that has been used frequently in bleeding from the tonsillar fossa. The needle was improved not from the standpoint of adding to the already extensive number of instruments that are on the market but because I had found a definite need for it. Many times some difficulty is encountered in the use of the original type of needle or of some other type. With the modified curve, it is much easier to carry the suture to deeper and more inaccessible regions. The open eye makes it unnecessary to pass the entire length of catgut through the eye, thus avoiding the danger of shredding

The suture needle.

or abrading the suture material, especially if the eye has been roughened by use. The type of curve used is adaptable for both fossae.

The accompanying photograph shows the type of open eye in this new needle. The slit cutting through the eye permits one to lift the suture out easily and to tie it without much loss of time. The opening accepts either a no. 0 or a no. 00 catgut suture. This needle has been particularly helpful in cases in which the two pillars of the tonsillar fossa had to be tied or a sponge had to be sutured in place. This needle has been used for over a year with good results.

The George P. Pilling & Son Company, of Philadelphia, manufactures this needle.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

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THE PARANASAL SINUSES

SAMUEL SALINGER, M.D.
CHICAGO

(Concluded from page 247)

MALIGNANT TUMOR

Knauth [138] cites 3 interesting cases in which early diagnosis was missed.

The first patient, a woman aged 22, consulted an oculist on account of suppuration of a tear sac. Examination of the sinuses showed only a slight cloudiness of the antrum, which aroused no suspicion. Six months later there was a palpable gland at the angle of the jaw. Reexamination and operation on the antrum revealed a basaloma. The patient died eighteen months later.

The second patient had marked exophthalmos, and examination revealed only enlargement of both inferior turbinates. A Krönlein operation disclosed a cyst on the floor of one orbit. Microscopically it resembled a basaloma. Eight days later a radical operation on the antrum was done. A mucocele was found in the roof of the antrum, which histologically proved to be a carcinoma.

In the third patient the involvement began with impaired vision and exophthalmos. Since there was a history of previous infection of the antrum it was opened and cleaned out, as were the ethmoid sinuses. No pathologic condition was found. One month later the operation on the antrum was repeated. The sphenoid sinus was also opened. Histologic examination of tissue removed revealed a basal cell carcinoma.

The Bergers [139] present a sketchy review of several reported statistics on carcinoma of the antrum, showing the percentage of cures and the methods of treatment. They go into more detail on the subject of differential diagnosis, citing such conditions as tic douloureux, simple sinusitis, aspergillosis, osteomyelitis, acute dental cyst and odontoma, the symptoms of which may simulate those due to carcinoma. Several cases are reported.

The first patient was a woman of 60 who had a mixed cell sarcoma of the antrum. It was treated by diathermy excision through a Caldwell-Luc approach followed by eleven sets of roentgen treatments given through three portals at

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138. Knauth, W.: Zur Frühdiagnose der Nebenhöhlentumoren, Dissert., Jena, 1936.

139. Berger, E. L., and Berger, M. D.: Neoplasms of Antrum, Laryngoscope **46**:137 (Feb.) 1936.

37.5 cm., with filtration of 0.5 mm. of copper and 1.5 mm. of aluminum. Cross-fire radiation was effected, with a 70 per cent erythema dose. Eighteen months later the patient presented symptoms suggesting cerebral metastasis and died. Autopsy, however, failed to reveal any evidence of sarcoma anywhere in the body.

The second patient was a man who was operated on for carcinoma of the antrum and treated with roentgen rays. The histologic diagnosis was papillary carcinoma. There was no recurrence up to two years.

The third was a man whose symptoms were proptosis and swelling of the lids, which appeared six months before he was examined. A bullous mass was seen in the left nasal meatus, and the antrum was dark. Exploratory puncture revealed a large amount of brownish gelatinous fluid. Iodized poppy-seed oil was injected and showed a cystic mass eroding the floor of the orbit and the ethmoid area. A Caldwell-Luc exposure revealed a bifid sinus, the anterior portion being large and filled with cystic fluid. Histologic examination disclosed a papillary structure lined with columnar cells and some goblet cells but no evidence of carcinoma.

Jacod [140] has had good results following surgical excision and roentgen treatment in cases of carcinoma of the ethmomaxillary area and presents 4 patients who were treated in this manner and were living and well four, seven, five and thirteen years later. The operation is done through a lateral rhinotomy, with every effort being made to do a block excision. Roentgen therapy is given prior to operation. The author claims that it serves to block the lymphatics and to sterilize the tissues, so that when the operation is extended into the healthy bed there is less likelihood of a recurrence.

Wassink [141] reports a series of 106 cases of malignant tumor of the antrum and the ethmoid sinuses which were observed in fifteen years, with cure in 60 per cent of the cases of operable and borderline involvement. These results are compared with those in a similar series prior to 1922, which were bad. The author attributes the improved results in his later series to standardized treatment consisting of radical exenteration with electrocoagulation followed by roentgen or radium treatment with the Coutard technic. It is difficult to compare Wassink's results with those of other clinics, because he excludes the cases in which the condition is "inoperable," which in other clinics are usually included in the entire group.

Fulst [142] presents a study of the material observed in the Ear, Nose and Throat clinic at Cologne from 1929 to 1935. Six cases are carefully

140. Jacod, M.: Les épithéliomas du carrefour ethmoidi-maxillaire. Leur traitement par l'association roengenthérapie-chirurgie. Résultats éloignés, Ann. d'oto-laryng., November 1935, p. 1161.

141. Wassink, W. F.: De behandeling van de kwaadaardige gezwellen van de bovenkaak en van de zeefbeencellen, Nederl. tijdschr. v. geneesk. **80**:1201 (March 21) 1936.

142. Fulst, W.: Beiträge zur Aetiologie, Symptomologic und Therapie der Carcinome und Sarcome der Kieferhöhle, Dissert., Köln, 1936.

analyzed, and the indications for therapy are pointed out. Apparently the procedures follow closely the accepted methods of other large clinics and produce similar results.

Beck and Guttman [143] review the literature on basaloma and express the belief that the tumor is a mucous basal cell growth showing a course comparable to that of basal cell tumor of the skin. Two cases are reported. In the first the growth involved the antrum and was exposed through a sublabial incision and treated with radium. A recurrence was noted a few months later, necessitating reoperation and treatment with radium and roentgen rays. The tumor receded, but sufficient time had not elapsed to determine whether or not the patient would be cured. The second case was that of a man of 51 whose symptoms were headache, impaired vision and vertigo. A tumor was found by nasopharyngoscopy. A subtemporal decompression was done, but the symptoms progressed and exophthalmos appeared. The brain was explored through a bone flap in the left frontal region. A mass involving the base of the brain in the pituitary region was exposed. It was red and pulsating and seemed to involve both the anterior and the middle fossa. The patient recovered from the operation and died of pneumonia three years later. Autopsy revealed a lobulated mass involving the base of the brain. It was pinkish gray and was attached to the dura, extending from the crista galli to the sella turcica and laterally to the temporal portion of the parietal bone. It involved the sphenoid sinuses, both ethmoid sinuses and both antrums. The authors point out that the chief characteristics of such a tumor are slow growth, a tendency to recurrence after removal and comparative freedom from metastases.

Carnevale-Ricci [144] reports a case of hypernephroma of the frontal sinus, which was discovered only at operation, which was attended with profuse bleeding. The primary renal lesion had not been diagnosed, since there were no local symptoms.

Brunner [145] seems unwilling to subject his patients with sarcoma of the ethmoid region to surgical treatment, since the primary mortality is high (20 per cent, according to Ohngren) and the operation itself is mutilating. He is content to treat them with roentgen rays alone, at least until some better method is evolved. Three patients are presented who were treated in this manner and lived an average of two years before dying as a result of metastases in the brain.

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143. Beck, J. C., and Guttman, M. K.: Basaloma or So-Called Cylindroma of the Air Passages, Ann. Otol., Rhin. & Laryng. **45**:618 (Sept.) 1936.

144. Carnevale-Ricci, F.: Metastasi nel seno frontale di un ipernephroma latente, Arch. ital. di otol. **48**:73, 1936.

145. Brunner, H.: Zur Klinik der malignen Tumoren in der ethmo-orbitalen Region, Monatschr. f. Ohrenh. **70**:129 (Feb.) 1936.

Gauducheau and his associates [146] have no such scruples. Their treatment of an ethmomaxillary malignant growth consists of a lateral rhinotomy, with removal of tissue down to a healthy bed followed by the application of radium tubes, each holding 5 mg. and wrapped in petrolatum gauze, so as to avoid contact with the bone. Filtration consists of 1 mm. of platinum. The silk threads attached to the tubes are brought out into the nose, and the tubes are left in place from four to five days. The usual dose employed is 20 to 30 millicuries destroyed. The external incision is closed at once, and the tubes are removed through the nose. Of 11 persons thus treated, 5 survived, but the ultimate results are not given. For the alveolar type of maxillary carcinoma the authors recommend sublabial incision, exenteration of all diseased tissue and insertion of 5 mg. radium tubes into the cavity to provide a total of 28 to 45 millicuries destroyed.

Handke [147] presents an interesting case of a man of 43, who for a number of years had been treated for disease of the frontal and maxillary sinuses. He suddenly presented palsy of the external rectus muscle and was operated on through an external incision exposing the frontal, ethmoid and maxillary sinuses. The operation was followed by occipital headache, disturbances of speech and inability to close the eyes. When he was first seen by the author, there was a profuse purulent discharge from the nose, which was filled with granulations leading to the region of the middle turbinate and on probing was found to extend to the frontal and sphenoid sinuses. There was unilateral palsy of the external rectus muscle and the peripheral facial muscles. Histologic examination of a specimen removed revealed granulation tissue. Lumbar puncture showed a positive reaction to the Pandy test and 160 lymphocytes. Roentgenograms taken in Stenver's position showed some obscuring of the petrous tip. The patient was reoperated on by von Eicken, who cleaned out all the granulation tissue but found no malignant growth. Autopsy revealed a lymphosarcoma of the sphenoid sinus eroding the roof, invading the petrous tip and surrounding the pituitary gland. The author points out that the predominating lymphocyte count in the spinal fluid should have warned against a diagnosis of meningitis secondary to sinus infection and that the roentgenogram showing involvement of the petrous tip should have indicated an invasion from the nasopharynx or the sphenoid bone as against an intracranial tumor, which first invades the upper surface of the tip and the superior border of the petrous bone. He claims that primary sarcoma of the sphenoid sinus is rare.

146. Gauducheau, R.; Viel, Baron, and Landais: Traitement radio-chirurgical des épithéliomas du massif maxillo-facial, Médecine **17**:470 (June) 1936.

147. Handke, F.: Lymphosarkom der Keilbeinhöhlenschleimhaut unter dem Bilde einer rhinogenen Meningitis, Ztschr. f. Hals-, Nasen- u. Ohrenh. **41**:44, 1936.

SURGICAL INTERVENTION

General.—Haiman [148] attributes failure of surgical treatment in disease of the sinuses to an underlying allergy. This hypersensitivity may not be due to any specific allergen but may be an expression of an inherited or acquired vasomotor instability, which is evidenced by an anxiety state, vague gastro-intestinal disturbances, migraine, etc. Endocrine imbalance may be due to these anxiety states and lead to overstimulation of the thyroid, pituitary and adrenal glands. The general treatment with particular attention to diet is all important. The author treats nasal polypi by electrocoagulation with the bipolar electrode. He does not operate on any sinus unless pus is present and recurring. He believes that the rhinologist should treat all allergic patients, since he is in a better position to recognize the changing conditions within the nose.

Wagner [149] favors radical exenteration in chronic pansinusitis. He advises combining the external approach with the sublabial incision into the antrum. In a period of over five years he has done 27 such operations in a series of 50,000 clinic and private patients. In 8 the disease was associated with osteomyelitis. There was only 1 postoperative complication, a frontal fistula in a diabetic patient with a background of syphilis. He advises conserving the middle turbinate and uses a flap of mucous membrane whenever possible.

Daito [150] agrees that when several sinuses are involved it is best that they be attacked at one sitting. The technic advised is substantially the same as that given by Wagner.

Kecht and Dibold [151] consider the problem of surgical intervention on the sinuses in diabetic persons and advise operation only when the general condition of the patient is at its best. They cite several cases of acute suppuration of the antrum in diabetic persons with a high sugar content in the urine, a high blood sugar content and acetonemia. Puncture and irrigation were practiced, while active treatment with insulin was administered, and in several cases the Mikulicz operation was performed with good results. They also report a case in which a bullet in the ethmoid bone in a diabetic patient, causing suppuration, was removed endonasally, with rapid improvement generally as well as locally.

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148. Haiman, J. A.: Failure of Operative Surgery in Nasal Sinusitis, M. Rec. **143**:198 (March 4) 1936.

149. Wagner, W. A.: Management of Pansinusitis, South. M. J. **29**:9 (Jan.) 1936.

150. Daito, T.: Poly-und Pansinektomie bei heftigen Erscheinungen durch chronische Nasen-nebenhöhlenentzündungen, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **139**:300, 1935.

151. Kecht, B., and Dibold, H.: Diabetes und Eiterungen im Mittelohr, Nasennebenhöhlen und Rachen, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:288, 1936.

Maxillary Sinus.—Syme [152] was able to trace 77 of a consecutive series of 100 patients who underwent the Caldwell-Luc operation, 65 of whom reported good general results and 61 good local results for periods of one to three years. He believes that in cases in which there is some doubt as to the condition of the antral mucosa it is wise to inspect the cavity through an opening in the canine fossa rather than to permit the symptoms to continue without relief. He bases his indications for operation on positive roentgen findings, positive results from lavage, postnasal discharge, pus and nasal polypi. Naturally, if pulmonary symptoms are present one may be justified in operating with less positive local findings. He also advises the operation for patients who cannot afford the time for long-continued palliative treatment. By way of improvement, he suggests better roentgen technic and more careful attention to the other sinuses which may be affected at the same time. In his operative technic he prefers the vertical incision and avoids postoperative packing.

Hoover [153] offers some practical points in technic and indications for operation on the antrum. If progress in cases of acute disease is not satisfactory, one should make an opening in the inferior meatus for better drainage and ventilation. If the infection is secondary to acute dental sepsis, he advises waiting for localization or at least subsidence of the more acute symptoms before extracting any teeth or curetting a diseased alveolus. In cases of chronic infection he advocates radical operation when there is focal infection, such as chronic toxemia, myositis, arthritis, neuritis or renal infection, when the mucosa of the sinus is polypoid or cystic, or when osteomyelitis, carcinoma or a foreign body is present. He favors the combined vertical and horizontal incision, the former above the cuspid tooth forming an angle with the latter, which extends laterally above ¾ inch (1.8 cm.). If the ethmoid and sphenoid sinus are diseased, they may be cleaned out through this same opening. Packing is dispensed with unless there is excessive bleeding.

Alteri [154] agrees with many American and English authors that in many cases of chronic disease of the antrum the cilia may still function and the mucosa may return to normal if adequate drainage is provided. A large window in the inferior meatus frequently accomplishes this purpose. If visualization of the interior of the antrum is necessary, however, or if the inferior meatus is anatomically not favorable for an adequate opening, the author advises operating through the nasolabial angle or making the conventional sublabial incision.

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152. Syme, W. S.: Review of One Hundred Consecutive Caldwell-Luc Operations, Glasgow M. J. **126**:87 (Aug.) 1936.

153. Hoover, W. B.: Maxillary Sinusitis: Brief Discussion and Points in Technique, S. Clin. North America **15**:1603 (Dec.) 1935.

154. Alteri: Terapie chirurgica di affezioni dei mascellari, Morgagni **77**:1199 (Nov. 10) 1935.

Miller [155] believes that the Caldwell-Luc operation is done too often because the intranasal technic is not sufficiently worked out. He offers the following postulates:

> 1. A sufficiently large opening placed well forward and level with the floor of the meatus to enable the surgeon to remove polypi and to allow the discharge to escape freely by gravity has been proven by Proetz to persist even in the most gravely infected sinuses. 2. The restoration of normal ventilation inside the sinus which often becomes defective due to blockage of the normal ostium. The above desiderata are freely obtained by the intranasal antrostomy. The mucous lining unless grossly diseased and polypoid usually recovers after this operation.

To avoid blockage of the opening by tags of mucous membrane the author suggests destruction of the mucous membrane by electrocoagulation over the area where the bone is to be removed. The bone is pierced with a rasp and chisel, and the opening is enlarged with a bone forceps. Galvanocautery is then used to destroy the mucosa of the antrum opposite the bony opening. He believes that this procedure gives better assurance of a permanent opening than any other method.

Ipolyi [156] presents a résumé of ten years' experience in the University Clinic of Budapest, Hungary. On 1,209 patients, 1,413 antral punctures were done, with positive findings. Of the 1,413 cases, empyema of the antrum was cured in 65 per cent by irrigation, in 23 per cent by intranasal antrostomy and in 12 per cent by radical operation. In 1 case of the second group it was later necessary to do a radical operation, and in the last group (90 Caldwell-Luc and 11 Denker operations) the results were good in 100 per cent. The policy at this clinic in all cases of suppuration not due to dental infection, foreign body, neoplasm or osteomyelitis, was to treat conservatively by irrigation up to six weeks before resorting to surgical intervention. Puncture of the inferior meatus was the usual procedure. The Lothrop-Claou intranasal technic was followed, with removal of the anterior end of the inferior turbinate and removal of the naso-antral wall with its mucosa down to the floor of the nose, a chisel being employed to achieve this level if necessary.

A patient with adenocarcinoma of the antrum treated by Figi [157] by electrocoagulation and radium suffered from spontaneous discharge of saliva from the nose, which was due to scar tissue drawing Stenson's duct into the antrum. The condition was corrected in the following manner: The opening was located by giving the patient some lemon to suck. It was then "picked up through a small incision on the inner

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155. Miller, A.: The Drainage of the Maxillary Sinus, Brit. M. J. **1**:1299 (June 27) 1936.

156. Ipolyi, F.: Indikationen der chirurgischen Behandlung von Kieferhöhleneiterungen, Monatschr. f. Ohrenh. **70**:401 (April) 1936.

157. Figi, F. A.: Carcinoma of the Antrum: Transplantation of the Parotid Duct, Proc. Staff Meet., Mayo Clin. **11**:241 (April 15) 1936.

surface of the cheek below and posterior to its opening into the antrum. After following the duct upward it was cut across just at its antral opening, drawn down through a stab wound in the cheek about 2 cm. below this and sutured in place." The result was a normally functioning duct discharging into the mouth.

King [158] reports on 14 cases of intranasal antrostomy, in which the results were checked by the instillation of iodized oil. Roentgenograms showed 6 patients cured with apparently normal function of the sinus. In 3 cases the condition was clinically cured but filling defects were revealed with the iodized oil. In 5 cases there was no clinical improvement and the roentgen check with oil revealed pathologic tissue still present. The author's conclusion is that 50 per cent of the patients failed to recover not because the window was too small but because the diseased sinus mucosa was not removed.

Müller dos Reis [159] discusses the various accidents that may follow intranasal puncture of the antrum. He believes that severe complications, such as syncope, convulsions, paresis and amaurosis, are due to air embolus arising through stripping and rupture of the sinus mucosa. Phlegmon of the pterygomaxillary fossa is almost always due to an anomaly of the sinus and usually follows the use of a straight trocar. Hemorrhage may be caused by injury to the internal maxillary artery but also may arise from the sinus itself in the region of the inferior meatus. Riegele has shown that primary papilloma of the sinus may be the cause of hemorrhage. The author has observed necrosis of the naso-antral wall following repeated puncture with the Lichtwitz or the Von Eicken needle. He advises the use of a trocar modeled after that of Becco, which is improved by the addition of a large handle.

Vernaza,[160] commenting on intranasal antrostomy, emphasizes the importance of removing the mucosa on both sides of the naso-antral wall to prevent subsequent closure of the bony opening. He presents a modification of Citelli's forceps, which has a long biting jaw that is placed obliquely to the shaft, so as to insure an even bite.

Sewall [161] is not satisfied with the results of the radical operation on the antrum, since recurrence has been shown to be due to partial obliteration, cyst formation and walled-off abscess. Blood clots, particularly,

158. King, E.: Some Clinical Observations on the Maxillary Antrum, Ohio State M. J. **32**:821 (Sept.) 1936.

159. Müller dos Reis, W.: Sobre a punção do sei maxilar, Rev. oto-laring. de São Paulo **4**:135 (May-June) 1936.

160. Vernaza, F.: La comunicación del seno maxilar a la fosa nasal por via endonasal, como drenaje de la sinusitis maxilar, Rev. méd. de Bogotá **45**:78 (July-Aug.) 1935.

161. Sewall, E. C.: The Antrum Operation: Describing a Method Affording Permanent Adequate Drainage Where Cure of the Empyema Is Essential, Laryngoscope **46**:493 (July) 1936.

have a tendency to organize. He therefore recommends keeping the gingival opening patent, so that the cavity may be cleansed and inspected until epitheliation is complete. He accomplishes this first by gauze strips, and later, when contraction takes place, he inserts a flanged rubber tube, which is self-retaining but is easily removed for cleansing. He has operated on 14 persons in this manner and thinks that the results justify the procedure.

Reports of postoperative cysts of the cheek following radical operation on the antrum seem to be common in the Japanese literature. Ishikawa [162] cites 2 cases and Fudita [163] and Kasahara [164] 1 each. In most of the cases the disease developed years after the operation. The frequency of this complication suggests that more than likely there was some fault in the technic.

Schmidt [165] is concerned with the effects of the Caldwell-Luc operation on the teeth. He examined the teeth of 45 patients after 63 operations and found neither increased incidence of caries nor sensory disturbances, as reported by other authors. Electrical tests were made with the d'Arsonval current, which has a direct influence on the tooth pulp. Twenty-two patients were followed up completely. In 6 cases there was no disturbance at all. In 16 there was primary anesthesia of the pulp in 26 teeth (premolars), in 7 of which the sensation returned within four to sixteen weeks. In 7 others the hyposensibility remained in 13 teeth. In only 1 case was there permanent anesthesia of the premolars, and in 1 case there was necrosis of the pulp. In 30 other cases (41 operations) there was a desensitization affecting 13 teeth in 4 patients, and 1 premolar was injured at operation, resulting in death of the pulp. Of a total of 425 teeth examined with the electrical current 39 (10.8 per cent) showed prolonged anesthesia and 2 showed necrosis of the pulp. Roentgenograms may help in avoiding projecting roots. The author concludes that the vitality of the teeth depends on the blood supply rather than on the nerve supply.

Ehrhardt [166] states that damage to the dental apparatus by the Denker or the Caldwell-Luc operation cannot be entirely prevented. To mini-

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162. Ishikawa, K.: Postoperative Cysts of the Cheek, Oto-rhino-laryng. **8**: 1024 (Nov.) 1935.

163. Fudita, Y.: Postoperative Cyst of Cheek (Kubo) with Mucocele of Ethmoid Cells, Oto-rhino-laryng. **9**:219 (March) 1936.

164. Kasahara, I.: Postoperative Cysts of Cheek, Oto-rhino-laryng. **8**:1020 (Nov.) 1935.

165. Schmidt, G.: Untersuchungsergebnisse über die Auswirkung der Kieferhöhlen-operation nach Caldwell-Luc auf die Zähne, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:355, 1936.

166. Ehrhardt, E.: Die Kieferhöhlenoperationen unter besonderer Berücksichtigung der dentogenen Verhältnisse, Dissert., Leipzig, 1935.

mize this danger he recommends a high incision and removal of as little bone as possible from the facial wall, care being taken not to resect too close to the floor, a distance of 0.5 cm. being considered the minimum.

Dahm [167] made postoperative tests of the teeth with galvanic and faradic currents after 30 Caldwell-Luc operations. The testing was done every three to six months. Complete anesthesia was observed to the faradic current up to six months and hypo-esthesia up to nine months. Sensitivity has nothing to do with vitality, since a tooth may be vital even though insensitive.

Frontal Sinus.—Hajek's [168] experience leads him to the conclusion that it is wrong to stick to only one procedure, since various methods have advantages peculiar to certain particular conditions. His tendency is toward conservatism, and even when a radical operation is indicated he avoids damaging the mucosa of the duct. He is particularly careful not to disturb the mucosa anywhere, and he stresses the importance of maintaining the patency of the duct. When an external exposure is required, he advises keeping the wound open until it is certain that the duct is free. When complications are present or impending, one's main purpose should be to eradicate the pathologic tissue completely, using whatever technic may be indicated, regardless of cosmetic results. Once the disease is cured, a subsequent plastic operation may be done to repair the deformity.

Hofer and Motloch [169] find fault with both the Killian and the Riedel operation. The former is preferable in most cases, but the difficulty is in preventing the soft tissues, especially the orbital tissues, from blocking the duct; also in large sinuses the external portion of the sinus may be blocked off and form a blind pocket. Even in the Riedel operation, there is no assurance that blind pockets will not remain and cause recurrence. For years the authors have advocated two procedures to insure a patent wide communication with the nasal cavity: (1) leaving the ascending process of the superior maxilla alone, since it forms a bulwark externally for the duct and prevents sinking in of the soft tissues, and (2) thorough exenteration of both the anterior and the posterior ethmoid sinuses. A drain is used for eight to ten days.

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167. Dahm, H.: Zur Frage der Zahnschädigungen nach Kieferhöhlenoperationen unter besonderer Berücksichtigung der an der Westdeutschen Kieferklinik nach Luc-Caldwell operierten Kieferhöhlenerkrankungen, Deutsche Zahnheilk. **3**: 395, 1936.

168. Hajek, M.: Meine Erfahrungen über die radicale Behandlung der Stirnhöhleneiterungen, Monatschr. f. Ohrenh. **70**:641 (June) 1936.

169. Hofer, G., and Motloch, T.: Zur radikalen Operation der Stirnhöhle. Monatschr. f. Ohrenh. **70**:1339 (Nov.) 1936.

Kos [170] describes his results in a series of 200 cases of chronic frontal sinusitis in which operation was done through an external approach devised by Prof. David de Sanson, in which only sufficient bone is removed from the floor at the fronto-ethmomaxillary junction to permit inspection and the introduction of curets. He is guided by the roentgenograms as well as by an intranasal lamp, and he exenterates the diseased mucosa with a gauze-wrapped curet to avoid injury to the bone. He also stresses the importance of removing the ethmoid cells.

Matis [171] describes the technic which he has followed for a number of years and previously described in the German literature. To avoid external scars, he approaches the floor of the frontal sinus by way of the margin of the pyriform aperture, which is bared by an intranasal incision along its border. After elevating the periosteum externally as well as the mucosa internally, he removes as much of the ascending, or frontal, process of the superior maxilla as is necessary to give free access to the lacrimal groove and the floor of the frontal sinus. The latter is removed with small chisels and curets, thus affording free inspection of the sinus, which is then dealt with according to the pathologic involvement present. If necessary, the ethmoid cells can be exenterated as far back as the sphenoid sinus. He claims that this approach is applicable in all cases except those in which intracranial complications are present, and he states that he successfully performed the operation in 53 cases in the four years before the report was made. The details of the technic are not as fully illustrated as in some of his previous communications.

According to Bergara,[172] the size of the frontal sinus should determine the type of operation employed. Frontal sinuses should be divided into three groups according to their transverse diameters, as determined by roentgenograms: 1. Those with a diameter less than 18 mm.—the element of stasis is inconsiderable, and intranasal enlargement of the nasofrontal duct is usually all that is required. 2. Those with a diameter of 18 to 30 mm.—these comprise 23 per cent of all sinuses and should be treated according to the type of pathologic process present. They are most frequently amenable to intranasal operation. 3. Those with a diameter in excess of 30 mm.—the element of stasis is present in 86 per cent. They are best treated by the external osteoplastic method, which affords an adequate approach to the sinus, the duct and the ethmoid sinuses and leaves a minimum deformity. It is contraindicated, however, in the presence of intracranial complications.

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170. Kos, J.: Tratamento cirurgico das fronto-etmoidites cronicas, Rev. oto-laring. de São Paulo **4**:1 (Jan.-Feb.) 1936.

171. Matis, E. I.: Le traitement chirurgical du sinus frontal et des cellules ethmoidales d'apres la methode sous-periostee, Ann. d'oto-laryng., July 1936, p. 690.

172. Bergara, R. A., and Bergara, C.: Consideraciones sobre la sinusitis fronto-ethmoidal crónica, An. de oto-rino-laring. d. Uruguay **5**:192, 1935.

Krainz [173] claims that the vast majority of infections of the frontal sinuses are complicated by diseases of the ethmoid and sphenoid sinuses. The ethmoid and sphenoid sinuses were concurrently involved in 105 (62 per cent) of 170 cases, the maxillary sinus in 143 (84 per cent) and all the sinuses in 82 (48 per cent). At the Innsbruck Clinic, in Austria, since 1925 he and his associates have followed Halle's technic with slight modifications; the middle turbinate is not cut loose, but a flap of mucous membrane is first dissected off. The frontal sinus is entered with a chisel, the bur being used only to smooth rough edges of bone. In this entire series secondary removal of polypi was required in only 5 cases, and in 9 reoperation was subsequently done by the external route.

Moulonguet and Demaldent [174] have for a number of years employed a combination of the Lothrop and the Sébileau operation with excellent results. The chief items mentioned are unilateral incision and opening of the frontal sinus in the naso-ocular angle, opening of the opposite frontal sinus through the intersinus septum, drainage into the nose by way of a double passage and removal of the sinus mucosa only when it is macroscopically diseased. The operation is especially useful in large, deep frontal sinuses and is indicated in cases of chronic bilateral disease when intranasal measures have failed.

Muck [175] claims to have cured several patients with chronic frontal sinusitis with polypoid degeneration of the mucosa through a simple procedure involving a minimum of surgical technic. An opening about 1 cm. in diameter is made into the sinus near the root of the nose. The sinus is irrigated with a saline solution and dried with cotton. It is then filled with a 10 per cent solution of iodine in alcohol, and the head is turned in every direction, so that the solution may reach every part of the interior of the sinus. The mucosa becomes brownish red. A piece of rubber tubing large enough to cork the hole is inserted just far enough to miss touching the posterior wall. It is surrounded loosely with gauze, over which an ordinary wire tea strainer is fastened with adhesive tape or a bandage. The idea is to permit air to enter the sinus freely from the outside. Two days later the sinus is again irrigated with a saline solution, and irrigation is repeated daily until the solution returns clear. The iodine is used only once or twice. It takes from one to four weeks for the sinus mucosa to return to normal, at which time the opening is permitted to close.

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173. Krainz, W.: Zur Behandlung der chronischen Stirnhöhleneiterung, Monatschr. f. Ohrenh. **70**:1066 (Sept.) 1936.

174. Moulonguet, A., and Demaldent, J. P.: Le traitement chirurgical des sinusitis frontales chroniques, Ann. d'oto-laryng., January 1936, p. 1.

175. Muck, O.: Heilung chronischer Stirnhöhleneiterungen ohne Entstellung durch ein chirurgisch-physikalisches Verfahren, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:477, 1936.

Taptas [176] advises various procedures according to the size of the sinus. A sinus that does not extend beyond the center of the superior orbital margin is treated through the establishment of a large fronto-maxillary opening, with immediate closure of the external incision. If the sinus extends to the outer end of the brow, a counter-opening is made near the temporal margin of the sinus to permit curettement of the interior. This obviates any extensive deformity. In acute suppuration or acute exacerbation of a large sinus the external opening is kept patent until the acute symptoms subside. When the sinus is large and has a deep orbital recess, especially if previous operation has been ineffective, he recommends obliterating the temporal and supra-orbital recesses in order to limit the chances of retention or recurrence. For a diffuse osteitic process with persistent suppuration and granulations despite the previous procedure it may be necessary to efface almost the entire sinus. For bilateral involvement the Lothrop technic is advised.

Reeves [177] obtained good results in 4 cases of persisting frontal fistula by thoroughly cleaning out the frontal and ethmoid sinuses through a Killian procedure, taking especial care not to wound the naso-frontal duct, which is protected by passing a no. 2 Sullivan probe from above downward to isolate it. Drainage is maintained by passing petrolatum gauze from the open cavity through the duct into the nose. It is removed in forty-eight hours, and no further treatment is required.

Wood [178] stated that in acute frontal sinusitis edema of the lids in itself is not an indication for external operation. "It is doubtful whether any case of orbital cellulitis without evident orbital abscess demands immediate operative interference." When pus is demonstrated to be present, just enough surgical opening is permitted to insure drainage, and this is accomplished by entering the sinus through the compact bone of its anterior wall. The only exception to this rule would be made in the presence of intracranial complications or already existing osteomyelitis.

The Ingals gold tube was used by Amsden [179] in 3 cases and left in place for six, two and two years, respectively, without untoward symptoms or recurrence of sinusitis. No theory is given as to the ultimate fate of the tube.

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176. Taptas, Nicolas: Traitement des sinusites suppurees recidivantes (a propos du traitement de la sinusite frontale), Presse méd. **44**:1486 (Sept. 23) 1936.

177. Reeves, E.: External Radical Frontal Sinus Operation with Retention of the Original Osteum Frontale, Laryngoscope **46**:446 (June) 1936.

178. Wood, G. B.: Operating in Acute Frontal Sinusitis, S. Clin. North America **16**:595 (April) 1936.

179. Amsden, H. H.: Permanent Drainage for Frontal Sinusitis, Laryngoscope **46**:184 (March) 1936.

McLeod and Lux [180] report a case of fistula into the frontal sinus at the supra-orbital margin, the result of an operation performed eleven years previously. The margin of the lid was retracted by the scar so that marked eversion resulted. An intranasal operation was first done and was followed by an external operation in which the tract was completely excised. The lid was then dissected loose, part of the tarsus was removed and a full thickness graft was applied, which corrected the ectropion.

Ethmoid and Sphenoid Sinuses.—Luongo [181] gives an excellent step by step description of the radical external operation, emphasizing the anatomic landmarks and the essential points in technic. The various instruments devised by himself and Ferris Smith are shown, and their proper use is defined. He favors the use of trinitrophenol for loosening and removing the mucous membrane. He also describes a periosteal flap which protects the raw bone of the nasal bridge. Rubber tubing filled with strands of silkworm gut is used for drainage. In several of his cases the dura was exposed in the region of the fovea ethmoidalis, but no damage resulted. If the dura is accidentally exposed, he advises taking away more bone to enlarge the exposure, because it lessens the danger of infection being trapped.

Among the points emphasized by Howarth [182] are (1) small incision, (2) adequate hemostasis by advance infiltration with a 1 per cent solution of procaine hydrochloride and the use of cocaine paste in the nose (no mention of ligation), (3) a large opening into the nose effected by extensive removal of the nasal processes of the frontal bone and the ascending process of the superior maxilla, (4) thorough exenteration of the most anterior of the ethmoid cells and (5) maintenance of the patency of the duct against pressure from the orbital contents by the free use of silver nitrate and bougies. As to Thiersch grafts, the author favors their use and recommends painting them with collodion before transfer, which facilitates the handling of the graft. The latter is kept in place with a tube, which is left undisturbed for eight days. He also mentions a tissue called "protective" for covering the graft, which has been in use at St. Thomas's Hospital in London, England, for more than thirty years.

McNaught [183] claims that failure of the external fronto-ethmoid operation is due to two causes—constriction of the nasofrontal opening

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180. McLeod, J., and Lux, P.: Cicatricial Ectropion as a Result of Mucocele of the Frontal Sinus, Arch. Ophth. **15**:994 (June) 1936.

181. Luongo, R.: The External Frontoethmosphenoidal Operation, Laryngoscope **46**:1 (Jan.) 1936.

182. Howarth, H.: Some Points in the Technique of the Fronto-Ethmoidal Operation, J. Laryng. & Otol. **51**:387 (June) 1936.

183. McNaught, R. C.: A Refinement of the External Fronto-Ethmosphenoid Operation, Arch. Otolaryng. **23**:544 (May) 1936.

and untreated disease of orbital extensions of the ethmoid cells. He finds Sewall's flap inadequate in large frontal sinuses with narrow nasal vaults and particularly in cases of bilateral involvement in which the Lothrop operation is indicated. The author has devised a flap for use in such cases, which is taken from the septum. In the operation he removes the upper part of the nasal bone and the frontal process of the superior maxilla without penetrating the nasal mucosa. The frontal sinus is entered from the orbit, and the ethmoid and sphenoid sinuses are cleaned out by removing the lacrimal bone and the lamina papyracea. The entire floor of the frontal sinus is removed. Lateral extensions are cleaned out through a separate incision in the lateral portion of the brow. The nasal mucosa forming the roof of the nose is now separated as far back as the cribriform plate and downward for 2 or 3 cm. A flap hinged above is cut loose, which measures 1.5 by 4 cm. The interfrontal partition is now removed, including the heavy bone in the midline consisting of the nasal process of the frontal bone and the thick upper ends of the nasal bones, leaving only a shell to support the root of the nose. The flaps of mucosa are unfolded to extend over the floor of the frontal sinus and are held against the orbital periosteum by gallbladder tubing ⅜ inch (1 cm.) in diameter passed upward from the nasal cavity. The end-result is to convert both frontal sinuses and the upper part of the nasal cavities into one space lined with mucosa.

Futch [184] favors a thorough trial of conservative measures before resorting to operation, since in many cases the disease clears up. Indications for operation are based on the degree of constitutional involvement as well as on the local signs. He advises anesthesia with tribromethanol in amylene hydrate, and in the technic he emphasizes the importance of removing the nasal wall of the ethmoid capsule with the superior turbinate. The danger of meningitis from opening neural sheaths has been overestimated. He has had no trouble in this respect; neither has he seen any loss of olfactory function. He has had no trouble with hemorrhage and has tied the sphenopalatine artery in only 4 per cent of his cases. The average length of hospitalization has been 13 days, and the duration of postoperative care from six weeks to four months. At first the patients are treated daily with 1 per cent ephedrine and packs saturated with a 10 per cent solution of mild protein silver; lavage with a physiologic solution of sodium chloride is begun on the fourth day. Four of 6 persons with asthma showed improvement, and 4 allergic patients were definitely improved. The use of vaccines, both before and after operation, seemed to be of some value.

184. Futch, C. E.: A Résumé of One Hundred Transantro-Ethmosphenoid Operations, Surg., Gynec. & Obst. **62**:509 (Feb.) 1936.

Bryant [185] is enthusiastic about the external radical operation, having had good results in 28 operations performed at the otorhinologic service of the University of Minnesota in the past year. The general plan of Sewall, Ferris-Smith and Lynch was followed, and the operation was done on patients giving evidence of "third or fourth degree" involvement who had failed to obtain relief from intranasal operations. The operative findings usually revealed more extensive pathologic involvement than was indicated by the roentgenograms. This was especially true of the periorbital cells. There were 3 cases of postoperative diplopia lasting from one to three months.

Simpson [186] lists thirteen indications for the external operation, some of which are open to controversy. In the discussion of his paper Pratt, Black and Israel all stressed the necessity for conservatism and agreed that the external radical operation is indicated only as a last resort in certain well defined types of case. Certainly "headaches" and "eye and optic nerve affections resulting from sinus disease" cannot be accepted as stringent indications for external operation without due qualification.

To minimize the scar of the external operation, Yates [187] advises an incision through the brow or just below it and mobilization of the soft tissues, retracting the lower margin of the incision downward so as to be able to "cut through the fibers of the orbicularis at a level below the supra-orbital margin and therefore below the supra-orbital and supra-trochlear nerves and vessels. By further retraction the incision in the muscle can be continued to its inner margin to a point above the inner canthus. When this is done, it is found that the tissues of the lax area, in which unsightly scars are apt to form can be retracted downwards and are therefore not incised." The author has been able to elevate the periosteum and to insert the orbicularis oculi muscle from the frontal bone and the ascending process of superior maxilla, so as to carry out the Howarth, Kisch and Smith technic with practically invisible scarring.

Sphenoid Sinuses.—Chase [188] does a complete submucous resection of the septum, continuing back to the rostrum of the sphenoid bone and separating the mucosa from the anterior face of both sphenoid sinuses. The anterior walls of the sphenoid sinuses are then broken down by

185. Bryant, F. L.: Surgery in Chronic Sinus Disease, Minnesota Med. **19**: 364 (June) 1936.

186. Simpson, W. L.: The Indications for the External Ethmosphenofrontal Sinus Operation, South. M. J. **29**:594 (June) 1936.

187. Yates, A. L.: Invisible Scars in External and Ethmoidal Operations, J. Laryng. & Otol. **51**:715 (Nov.) 1936.

188. Chase, W. D.: The Sewall Sphenoid Sinus Operation, Modified, Laryngoscope **46**:181 (March) 1936.

hooks and forceps, and as much of the intersinus septum is removed as may be required. The floor of the lower sinus is leveled off as far as possible. A flap of mucous membrane on the same side, consisting of the mucosa of the face of the sphenoid and about 2 cm. of septal mucosa, is turned into the sinus covering the edges of exposed bone. The author has not found it necessary to ligate the vessels.

NONSURGICAL THERAPY

Proetz [189] cautions against operations on the sinuses which throw them into the general nasal cavity because of the drying effect of too much air on the delicate ciliated lining of the sinus. As a rule, he is not in favor of wide exenteration, because the after-effects, such as dryness and pain, are frequently as bad or worse than the preceding discharge and discomfort. For acute rhinitis he advises instilling a few drops of ephedrine in a saline solution with the head in the exaggerated supine position. He considers it more effective than sprays or packs. It should be followed by inhalations of steam vapor to supply moisture until the membrane is able to do so. In the early stages of acute rhinitis displacement therapy may be contraindicated because "in this hypersensitive stage the negative pressure may add to the congestion and because the fluid penetrates indiscriminately to all the sinuses and not only may carry infectious material about but also may hamper the function of the uninvolved ostia which are exceedingly important in defending their respective sinuses against infection." As soon as some immunity is established, the treatment may be safely employed as described and is usually effective. He also advises against the use of oils except when the membranes are dry. When the cilia and the mucous blanket function properly, oil may impede their action. He recommends using an isotonic solution, such as Ringer's solution, for irrigation.

Mithoefer [190] again stresses hypothyroidism of a low grade as a cause of chronic sinusitis and emphasizes the point that "the more the patient requires the drug the smaller should be the initial dose." He has found the hypothyroid state associated with intestinal stasis and signs of a pale nasal mucosa together with the appearance of a thin white infiltrate along the nasopharynx. Mild chronic ethmoiditis causing headaches is frequently relieved by infracting the middle turbinate and applying trichloro-acetic acid to the floor of the ethmoid sinus, the middle turbinate and the opposing septal mucosa. He is not in favor

189. Proetz, A. W.: Treatment of Sinus Disease, Pennsylvania M. J. **39**:385 (March) 1936.

190. Mithoefer, W.: The Treatment Other Than Operative of the Nasal Accessory Sinuses, Ann. Otol., Rhin. & Laryng. **45**:420 (June) 1936.

of tampons saturated with mild silver compounds, since he has found a simple saline solution just as effective. Besides, he has encountered several cases of argyrosis. Dilation of the ostia of the maxillary, frontal and sphenoid sinuses has proved helpful in some cases of headache. When irrigating the frontal sinus he prefers a 1 to 1.5 per cent solution of calcium chloride because of its hygroscopic effect. For irrigating the antrum he recommends Fisher's modification of Ringer's solution—sodium chloride, 263.7 Gm.; calcium chloride (dry), 21 Gm.; potassium chloride, 10.6 Gm., and water, 1,000 cc. Twenty-five cubic centimeters of this solution is placed in 500 cc. of sterile water for irrigation plus a small amount of procaine hydrochloride for the relief of pain during the treatment. The author finds it important to teach children to blow the nose and recommends Hickling's drill, which is as follows: 1. Hold a piece of gauze beneath the nose. 2. Grasp the top of the nose between the eyes with the right thumb and forefinger, the elbow being raised to the level of the shoulder and the nostrils being left open. 3. Blow the nose and at the same time bring the head forward and downward and depress the elbow to the waist line, the top of the nose still being held as before. 4. Inspire and raise the head to the original position, repeating the maneuver from ten to fifteen times in a rhythmic manner.

In the early stages of acute rhinitis Ashley[191] gives a capsule containing ephedrine, ¼ grain (0.016 Gm.), phenobarbital, ⅜ grain (0.024 Gm.), and atropine, 1/600 grain (0.0001 Gm.), every three hours. He also regulates diet, elimination and room temperature. When nasal congestion is apparent, he uses packs saturated with a solution of 5 per cent neo-silvol and 0.25 per cent neosynephrin left in place for ten minutes. Even children as young as 3 or 4 years are treated in this manner, as the depleting effect of the combination is claimed to be helpful. The author believes that all colds in their earliest stages are allergic responses and that "the allergy develops because of a filterable virus made active through the failure of the body to accommodate itself to unfavorable climatic and environmental changes; that the purulent stage is due entirely to secondary invaders."

Black[192] is impressed with the reaction of the laity to operation on the nasal sinuses—skepticism, fear and a general impression that one operation on a sinus means a succession of operations. He believes that all sinus infections are chronic, having their inception in childhood and being susceptible of frequent acute exacerbations. He favors treating these with packs saturated with neosynephrin emulsion, 0.25

191. Ashley, R. E.: Prevention of Chronic Sinusitis, Southwestern Med. **20**: 349 (Sept.) 1936.

192. Black, W. B.: The Rational Treatment of Sinus Disease, J. Missouri M. A. **33**:260 (July) 1936.

per cent, cocaine hydrochloride, 3 per cent, and neosilvol, 10 per cent, together with hot packs over the face and the infra-red lamp. He is impressed with Jarvis' theory of acid-alkali imbalance and urges following the color index in regulating the diet. Permanent cure can be achieved only by thorough history taking to determine the type and extent of the pathologic condition.

Haslinger [193] recommends sweat baths and light therapy in cases of acute involvement. He prefers the application of a wet cloth to the face (leaving the nostrils free for breathing) and using a lamp for fifteen to twenty minutes at a time until the head perspires freely. The light is turned off, but the patient remains under the lamp, so as to cool off gradually. This treatment is repeated three or four times daily. He advises using a solution of cocaine hydrochloride for shrinking the mucosa and prefers not to combine it with epinephrine, since the latter frequently leaves a fibrinous deposit, which may tend to block drainage.

Moore [194] decries the use of suction because it frequently increases the swelling. He has had good results with Dowling packs and autogenous vaccines.

Fitzhugh [195] finds that neosynephrin in a 0.5 to 1 per cent concentration produces a more lasting shrinking of the mucosa than ephedrine, with less danger of constitutional effects. In 15 cases in which it was used in a 0.0125 per cent solution by the displacement method the results were no better than with a 0.25 per cent solution of ephedrine but in some cases it was less toxic.

Parkinson [196] recommends a 1 to 3 per cent solution of ephedrine in a physiologic solution of sodium chloride instilled into the nose in the head-low position when the condition is acute. It is especially effective for children and is far better than the older method of merely dropping the medicament into the nose regardless of the position of the head. He advises that the patient be placed on his side with the lower shoulder elevated by a pillow, so as to allow the head to incline sidewise until the occiput is below the level of the chin at an angle of 45 degrees. The advantage of this position over the Proetz posture is that

193. Haslinger, F.: Konservative Behandlung der Nasen- und Nebenhöhlenerkrankungen, Wien. klin. Wchnschr. **49**:1260 (Oct. 9) 1936.

194. Moore, J. H.: Personal Observations on Paranasal Sinusitis, West Virginia M. J. **32**:410 (Sept.) 1936.

195. Fitzhugh, W. M., Jr.: Neosynephrin Hydrochloride in Otolaryngology, Arch. Otolaryng. **24**:425 (Oct.) 1936.

196. Parkinson, S. M.: Ephedrine in Physiologic Solution of Sodium Chloride and Lateral Head-Low Posture in Treatment of the Nose and Sinuses, Arch. Otolaryng. **23**:344 (March) 1936.

the fluid reaches the ostia of the anterior group of sinuses as well as those of the posterior group. Gentle suction as recommended by Proetz is advisable in some cases.

The effect of heat as variously applied was studied by Andreen and Osborne.[197] A thermocouple was introduced through an insulated catheter passed through a Coakley trocar, so that it made contact with the inner wall of the antrum. The temperatures were recorded by thermocouples connected with a sensitive Leeds and Northrup portable potentiometer. The thermocouples showed a sensitivity of 0.0255 millivolt per Fahrenheit degree. Seventeen pathologic antrums were treated by various heat-inducing methods, and frequent readings were taken for a definite period. The ability of these various agents to raise the intra-antral temperature was found to be in the following order: electromagnetic field and diathermy, thermospectral lamp, Cutler water-cooled lamp, compsolite, short wave diathermy and the Elliott machine. The first two mentioned raised the temperature from an initial 98.2 and 98.5 to 99.1 F., a surprisingly slight increase in view of the claims made for these methods in certain quarters.

Perpère[198] believes that infections of the sinuses may be benefited by sulfur spas if the water is used for vapor inhalations. "Vasomotor and congestive reactions respond favorably to natural carbon dioxide and radio-active gases."

Ruskin[199] records his experiences in the use of bacteriophage, having employed 20,000 2 cc. ampules of the d'Herelle type during 1933, 1934 and 1935. He finds the bacteriophage therapy of value in lessening the frequency of recurring acute attacks if used more or less continuously. When the disease is acute it is applied on a tampon after shrinking of the mucosa and is left in place for ten minutes. This is followed by suction and finally by spraying the nose again with bacteriophage. The patient must instil from 10 to 15 drops of the solution into each nostril every two or three hours after the treatment. In all cases of chronic involvement it is important that allergic factors, obstructions and dental infections be remedied first.

Kracaw[200] presents the results of three years' experience with the Krueger vaccine. "A year or more after completion of treatment in a previously reported series of 45 cases it was found that 28 of the 30

197. Andreen, M. A., and Osborne, S. L.: Measurements of the Temperature of the Maxillary Sinus After Treatment by Various Methods of Heating: A Comparative Study, Arch. Otolaryng. **24**:331 (Sept.) 1936.

198. Perpère: Traitement thermal des annexites respiratoires, Arch. M. Hydrol. **14**:165 (July) 1936.

199. Ruskin, S. L.: Bacteriophage Therapy in Nasal and Aural Disease, Laryngoscope **46**:107 (Feb.) 1936.

200. Kracaw, F. C.: The Treatment of Chronic Sinus Infection with Undenatured Bacterial Antigens, Laryngoscope **46**:26 (Jan.) 1936.

patients considered cured had maintained that status, while the 13 patients classified as presenting satisfactory clinical improvement all remained in that category." A second series, of 62 patients treated since the previous report, showed 52 greatly improved or cured. The author stresses the importance of proper selection of patients. His indications for using the vaccine are: (1) allergic rhinitis of probable bacterial origin and (2) chronic ethmoid, sphenoid or frontal sinusitis when there is no obvious evidence of inspissated pus and no anatomic interference with drainage. The treatment must be carried on over a period of four months with occasional subsequent treatments for five additional months. Experience only will determine what the proper "maintenance dose" may be in each case. The author states that in 10 of 18 cases definite arthritis was cured, in 5 it was improved and in only 3 it remained unchanged.

Fox and Harned [201] found that the nasal mucosa of hogs offers a resistant tissue for experiment, since the incidence of rhinitis in hogs is low. They tried various methods of obtaining extracts. The protein elements at first caused severe reactions; so the authors then turned to the possibility of obtaining a material akin to a hormone. They succeeded in eliminating the proteins by the use of solvents and obtained an extract which gave promise when used both orally and hypodermically. Many changes in the preparation of the extract were made, and the experimenting is still going on among a number of collaborating physicians and friends who are submitting to the treatments. At times striking results were observed. The authors are still looking for a specific precipitant for the active principle they believe to be present.

May [202] finds that physical therapy varies in effectiveness with different epidemics and seasons. Evidently, the infective agent is largely responsible for this state of affairs. Colds of the influenza type are particularly resistant. He offers the following procedure for aborting acute colds. The water-cooled mercury vapor arc lamp with a long quartz rod for insertion into the nose is used three or four times daily for three minute exposures. In the early congestive stage it frequently stops the process in from twelve to twenty-four hours. Recently, better results have been obtained by combining ultraviolet radiation with ultrashort wave diathermy. When the patient is confined to bed, the infra-red, or heat irradiation affords relief. Diathermy may be added a few days later.

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201. Fox, N., and Harned, J. W.: Use of Extract of Nasal Mucosa in Treatment of Acute and Chronic Rhino-Sinusitis, Arch. Otolaryng. **24**:89 (July) 1936.

202. May, F.: Physical Therapy in Antral Infections, M. J. Australia **2**:495 (Oct. 10) 1936.

Bryant [203] describes the Elliott treatment, which is claimed to be effective in combating acute disease. It consists of the introduction of closed rubber tubes into the nose connected with a heating apparatus whereby hot water is caused to circulate at a given temperature. Treatment is begun at 120 F., and the temperature is increased daily up to a maximum of 130 F. Much relief from pain and discomfort is thereby afforded. The author cites a series of illustrative cases in which recovery ensued after eight to fifteen treatments. The treatment has no effect on chronic conditions.

Based on observations in a series of 135 cases of both acute and chronic disease, Stein's [204] conclusions are all in favor of conservative treatment, figuring largely the use of physical therapeutic measures, such as infra-red rays, diathermy and short waves.

Blumenfeld [205] presents a new return flow antrum trocar, which he claims obviates the possibility of introducing irrigating fluid or secretions into any adjacent structures that may be accidentally punctured. It facilitates the recovery of uncontaminated secretions for laboratory study.

Lazarovits [206] is enthusiastic about the use of roentgen therapy for the relief of pain and discharge in acute frontal sinusitis. In 8 of 10 successive cases these were relieved by one exposure. The best results were obtained in involvement of only a few days' duration. The factors employed were as follows: 115 kilovolts; 4 milliamperes; 50 per cent of a unit skin dose. The duration of the treatment was seven to eight minutes, and a 4 mm. aluminum screen was used.

CLINICAL OBSERVATIONS

General—Fenton and Larsell [207] tried out four new drugs resembling ephedrine and made observations as to their shrinking effects as well as the reparative reactions in chronic inflammation. These drugs are tetrandrine methiodide in a 1 per cent solution, hordenine methiodide 0.5 per cent, benzyldimethylamine methiodide 1 per cent and beta-phenylethylamine methiodide 1 per cent. For 2 patients with chronic maxillary sinusitis two of these solutions were used by instillation, and beneficial effects were noted in 1 case. Operation and examination

203. Bryant, F. L.: Elliott Treatment of Sinus Disease, Laryngoscope **46**:853 (Nov.) 1936.

204. Stein, S.: The Treatment of Sinusitis in Adults, M. Rec. **144**:360 (Oct. 21) 1936.

205. Blumenfeld, L.: A New Instrument—A Return Flow Antrum Trocar, Laryngoscope **46**:475 (June) 1936.

206. Lazarovits, L.: Roentgenotherapy of Acute Inflammation of Frontal Sinus, Gyógyászat **76**:309 (May 17) 1936.

207. Fenton, R. A., and Larsell, O.: Substances Resembling Ephedrine in Experimental and in Clinical Sinusitis, Arch. Otolaryng. **24**:714 (Dec.) 1936.

of the mucosa, however, failed to reveal any evidence of a reparative process. Experimental animals with induced sinusitis similarly treated also failed to show any beneficial results. The authors feel, therefore, that the use of these substances would have to be restricted to comparatively acute conditions.

Sewall [208] distinguishes between a "false cold," which is an exacerbation of chronic sinusitis and confers no immunity, and a "true cold," which may start an epidemic and which confers immunity lasting from six to twelve months. The false cold is frequently due to chilling or exposure, and its symptoms subside rapidly on a change to milder weather. It is frequently merely a vasomotor response of a chronically hyperplastic mucosa. Chronic sinusitis is the seat of a streptococcic infection which during latent periods may change from the hemolytic to the viridans type. The author attributes to Streptococcus haemolyticus an etiologic rôle in the production and dissemination of colds which "is not denied by the importance of a virus."

Nodine [209] states that the essential factors in each case of disease of the sinuses are (1) the chemistry of diet of the patient, (2) the endocrine status and (3) allergy. He is impressed with Jarvis' work along these lines and cites the work of other authors in support. He is in favor of smears and washings for cytologic study and believes that a preponderance of small lymphocytes, some ciliated epithelial cells, plasma cells and a few polyps indicate hypertrophic, hyperplastic and edematous types of pathologic picture, whereas stratified epithelial cells, fibrous tissue cells and round cells indicate degenerative changes in the mucosa. The importance of these findings lies in the conclusion that a condition of the former type may yield to conservative treatment, whereas one of the latter type nearly always means that a radical operation is indicated.

Chase [210] offers a general review of sinusitis, with particular reference to predisposing and exciting factors. Among the many influences mentioned, most of which are well known, he mentions the habit of sleeping in cold drafty rooms and the fact that parents frequently allow children to get up too soon after an acute infection of the respiratory tract.

The diagnosis of chronic sinusitis, according to Parkinson,[211] depends on an accurate appraisal of histopathologic conditions existing within a sinus. "A reliable criterion of sinus pathology is the ability or lack of ability of sinus mucosa to recover following an acute inflammation.

208. Sewall, E. C.: Chronic Sinusitis, Arch. Otolaryng. **24**:413 (Oct.) 1936.

209. Nodine, E. R.: Some General Considerations of the Sinus Problem, M. Times, New York **67**:205 (July) 1936.

210. Chase, W. D.: Etiology and Diagnosis of Sinusitis, Pennsylvania M. J. **39**:389 (March) 1936.

211. Parkinson, S. N.: When Is Sinusitis Chronic? Ann. Otol., Rhin. & Laryng. **45**:721 (Sept.) 1936.

For a case of sinusitis to be cured—not to say improved—by a relatively simple procedure is good presumptive evidence that the pathology had not become chronic but had been simply acute or subacute." The author's experience is that in 75 per cent of the cases so-called chronic sinusitis "fails to show hyperplasia after a reasonable delay to allow resolution to occur following acute congestion."

Harper [212] claims that in many cases there is "hidden infection" of sinuses which cannot be definitely diagnosed by roentgen examination and transillumination but which gives rise to continuous or intermittent symptoms. In these cases in which there is a history of repeated or continuous colds, with postnasal discharge, he finds that the local findings often point the way to the diseased sinus. A boggy nasal mucosa, thick mucus along the floor or streaks of mucus along the septum and turbinates, an edematous appearance in and about the infundibulum and swelling of the middle turbinate are all significant findings. In addition, one may elicit a history of mental fatigue, depression, lack of ability to concentrate, a tendency to chronic bronchitis and asthma, rheumatic pains, constipation, etc., all pointing to a focus of low grade infection. Careful examination coupled with roentgenograms giving even slight evidence of infection frequently localizes the infection in the antrum and ethmoid sinuses. Often highly virulent bacteria may be recovered from the secretions. Involvement of this type, in the author's opinion, requires radical operation, and his results from such procedures have been exceptionally good. He particularly decries intranasal antrotomy as being unsurgical, and even for children he believes the transcanine approach to be the safest and surest method of eliminating the diseased focus.

Zwerling [213] discusses the practical aspect of sinus disease, stressing particularly the patient's point of view and the general attitude of the laity and their skepticism as to cures, the necessity for operation and prolonged treatment. Chronic infection makes for tedious treatment and half support by the patient. All the difficulties are pointed out by the author with the idea of providing a better perspective.

A thorough analysis of the patient's general condition, environment and habits is essential to eliminate contributing factors, and it is often necessary to enlist the cooperation of the general practitioner to eliminate these factors.

Krimsky [214] believes that the rôle of the sinuses as foci of infection has been much overplayed, his pessimism evidently resulting from

212. Harper, J.: The Importance of Nasal Sinusitis in General Practice, Glasgow M. J. **8**:1 (July) 1936.

213. Zwerling, S.: The Patient with Sinus Disease, M. Times, New York **64**: 522 (Dec.) 1936.

214. Krimsky, E.: Is Sinus Trouble Being Overstressed? A Critical Survey of the Sinus Problem, Laryngoscope **46**:460 (June) 1936.

experiences in dealing with persons unsuccessfully operated on whose symptoms were later demonstrated to be due to other causes. His statement, however, that the term chronic sinusitis should be applied only to conditions in which the local pathologic process is sufficient to require surgical intervention is perhaps too sweeping for general acceptance.

Ridpath [215] offers a good review of sinusitis in relation to general disease and is particularly impressed with the rôle of heredity in the incidence of sinusitis. He states that he has observed instances of sinus disease in every member and in two generations of certain families. An inherited lack of immunity may be a strong factor in the early appearance of sinus disease in some families.

Wood [216] presents an excellent résumé of the arteriovenous network of the nose and the network of nerves, particularly the parasympathetic, with the idea of clarifying the physiologic processes and responses of the mucosa to allergy, infection, etc. In discussing the action of the cilia in sweeping mucus backward to the throat, he states that blowing the nose is unphysiologic, since it goes against the ciliary stream. Furthermore, he says that "most sinus infections are brought about by forcibly blowing the infectious material from the nose proper where the tissue resistance is high and nature's defense mechanism is strong into the sinuses where the defense mechanism is weak and tissue resistance low." He advises educating patients to sniff the secretions backward into the throat. One wonders how many rhinologists at large are prepared to accept this suggestion.

In a discussion of headaches of nasal origin, Borries [217] and his associates warn against the diagnosis of hysteria in cases in which pathologic involvement of the sinuses cannot be diagnosed. Frequently true hysteria results when the patient's complaint is made light of by the physician. They call attention to hyperemia and "incarceration" of the middle turbinate as significant signs, particularly when the headache is relieved by the application of cocaine and ephedrine. Dilatation, cauterization or even removal of the turbinate may be necessary. He also mentions reflex occipital pains and myopathies and states that there must be a "peculiar correlation" between the mucosa of the nose and the nuchal muscles. As for treatment in such cases, stress is laid on the care of the sinus condition first. Later the myopathy must be

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215. Ridpath, R. F.: Relation of Diseases of the Sinus to Organic Disease, M. Times, New York **64**:513 (Dec.) 1936.

216. Wood, T. B.: The Present Status of Nasal and Sinus Disease in Relation to General Practice, M. Times, New York **64**:516 (Dec.) 1936.

217. Borries, G. V. T.; Cleminson, F. J., and Young, G.: Discussion on Headache Associated with Disease in the Nose, Proc. Roy. Soc. Med. **29**:1325 (Aug.) 1936; J. Laryng. & Otol. **51**:720 (Nov.) 1936.

treated by physical therapeutic measures. Patients with involvement of this type are particularly sensitive to changes in temperature. F. J. Cleminson in the same discussion states that marked pain in the ear may result from maxillary sinusitis and explains the phenomenon as due to radiation along the vidian nerve to the geniculate ganglion and thence through the ramus cutaneus facialis and Arnold's nerve to the auricle and the drum membrane. He also mentions vacuum headache from blocking of the antrum as well as from blocking of the frontal sinuses. Herbert Tilley questions Borries' statement that purely rhinogenous factors without involvement of the sinuses are the cause of recurrent headache, especially when there is a pathologic condition of the middle turbinate. He calls attention to "silent osteitis" as a common condition present in such cases in which no suppuration or secretion is in evidence. On the whole, the discussions is lucid and takes in various factors which go to make up the headache complex, with a rational evaluation which makes the article worthy of careful study.

Hadaschik [218] relates his experiences with a series of 52 cases of sinus infection occurring during an epidemic of grip. The condition was characterized by severe pains in the distribution of the trigeminal nerve. All but 3 patients recovered under conservative therapy. In these three the bone was involved, necessitating surgical treatment. Histologic examination of the tissues removed showed a marked exudative process with little cell infiltration. Fifteen of 29 persons with diseased antrums had severe neuralgia of the supra-orbital and infra-orbital nerves. In addition to these, there were 3 other cases of severe neuralgia in which no sinus disease was demonstrable. The author discusses the question as to whether the pains were due to a special affinity of the virus of grip for nerve tissue or whether they were the result of pressure on the filaments by swelling.

Parkinson [219] claims that the differentiation between headache due to impaired ventilation of the sinus and that due to some other causes is easily made by displacement filling with ephedrine in a physiologic solution of sodium chloride. Several illustrative cases are cited, and the author is enthusiastic about the method, both for treatment and for diagnosis.

Halphen [220] has discovered that recurring polyposis is not due to the ethmoid sinuses alone but frequently emanates from a diseased antrum. He speaks of polysinusitis polyposa as indicating edematous

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218. Hadaschik, E.: Nebenhöhlenerkrankungen und Neuralgien; Zwei häufige Symptome der Grippeepidemie 1935, Ztschr. f. Laryng., Rhin., Otol. **26**:312, 1935.

219. Parkinson, S. N.: Nasal Ventilation in Diagnosis and Control of Headache, Arch. Otolaryng. **24**:594 (Nov.) 1936.

220. Halphen, E., and Wisner: Polysinusitis polypeuses, Folia oto-laryng. orient. **2**:242, 1935.

diathesis and believes that it is due either to an endocrine imbalance or to protein sensitivity. Conservatism is usually practiced unless the pathologic process requires radical surgical treatment. In that case he recommends operating on the two sides separately at an interval of from two to three weeks.

Uffenorde [221] describes a latent form of sinusitis which resembles allergic sinusitis, except that all cutaneous tests give negative results. There are usually no findings in the nasal chambers proper but the patient complains of a protracted cold, a sensation of dulness in the head, pressure between the eyes and a tendency to frequent colds. Roentgenograms with contrast mediums revealed considerable thickening of the lining mucosa, but irrigation gave positive evidence of involvement in only 25 per cent of the author's cases. In one group of cases the patients complained of frequent severe neuralgic pains of the second division of the trigeminal nerve, which were resistant to heart and local treatment. In 5 cases the author noted involvement of the orbit in the form of slowly developing exophthalmos, which in 3 cases was mistaken for orbital tumor. Radical surgical operation was found necessary in most cases. The author reports 130 cases in which operation was done by the Caldwell-Luc method, with permanent cures in 65 per cent. In 20 per cent there remained a tendency to colds, which suggests the possibility that the author had overlooked the allergic factors despite his statement that cutaneous tests mostly gave negative results.

An analysis of a large number of postmortem studies made by Ledergerber [222] revealed the fact that 6 per cent of all deaths were due to sinus disease and that the percentage of mortality from all sinus disease was 0.37. Thirteen fatal cases were carefully analyzed. The most common cause of sinus complications was obstruction to drainage. Orbital complications were present in 5 per cent of all cases, and were fatal in 16 per cent of these. The most frequent avenue of spreading infection craniad was by way of osteomyelitis of the frontal bone.

Rhodes [223] found an increase in the incidence of sinus disease in the Middle West as a result of severe dust storms in the "dust bowl" area of Kansas, Oklahoma, Colorado and Texas. No mention is made of any particular or characteristic reaction of the nasal mucosa under these conditions. More intensive study should elicit some interesting findings.

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221. Uffenorde, W.: Nachträge zur Klinik der serösen Nebenhöhlenentzündung, Hals-, Nasen- u. Ohrenarzt. **27**:142 (July) 1936.

222. Ledergerber, E.: Ueber Todesfälle infolge Nasenbenhöhleneiterung, Dissert., University of Zurich, 1936.

223. Rhodes, W. L.: Dust Laden Air as a New Cause of Paranasal Sinusitis, M. Rec. **144**:363 (Oct. 21) 1936.

From a study of 172 cases of disease of the maxillary sinus Jankowski [224] concludes that "influenza and catarrh of the nose are the main causes." He claims that in 69.1 per cent of the cases the disease could be attributed to influenza. Of 94 cases of chronic purulent disease, recovery was obtained in only 3 without operation. The results of his operative procedures are not given, although he states that many different methods were used which proved unsuccessful.

Antrum.—Millar [225] traced 178 private patients formerly treated for infection of the antrum and found that total relief from symptoms was attained in 66 per cent by lavage. The same treatment of patients with latent infection yielded results in only 40 per cent. Endonasal antrotomy gave complete relief in 44 per cent and radical operation in 47 per cent. An analysis of the responses shows that the recurrence of colds and chronic cough was less frequent than the symptoms of postnasal discharge and nasal block. In other words, the two latter symptoms are more difficult to eradicate. The author believes that improved technic and closer attention to details might lead to complete relief of symptoms in 70 per cent of cases and to definite improvement in the remainder. He states that endonasal antrostomy should be used in children: "(*a*) When lavage has failed and the permanent teeth have not erupted. (*b*) When repeated lavage is impracticable . . . In adults . . . (*b*) When it is thought that continuous drainage will effect a cure. (*c*) In elderly people with gross pathological change, when radical operation is undesirable." He concludes that "vigorous conservatism is advocated in preference to masterful inactivity or radicalism" and advises regular lavage for one to three months before resort to surgical treatment. Radical operation is particularly to be avoided in patients suffering from asthma, vasomotor disorders and psychic conditions unless gross polypoid degeneration is present.

By "ventilation" O'Malley [226] refers to the alternating positive and negative air pressure accompanying the respiratory cycle as well as to ciliary activity. In acute sinusitis he advises against local treatment. "If there is much nasal occlusion it seems wise to leave this alone to subside on general lines, as no ventilation is safer for the moment than an imperfect or partial one, which only intensifies the vascular engorgement around the ostium by forced efforts or respiration, such as sniffling and blowing the nose, either of which is capable of creating a pressure

224. Jankowski, W.: Inflammation of Nasal Sinuses, Polska gaz. lek. **15**:61 and 79 (Jan. 26) 1936.

225. Millar, T. G.: Results of Treatment of Antral Infections: An Analysis of Cases, M. J. Australia **2**:487 (Oct. 10) 1936.

226. O'Malley, J. F.: Treatment of Maxillary Sinus Suppuration, Brit. M. J. **2**:1139 (Dec. 14) 1935.

action equivalent to 80 mm. of water or more." He further states: "There is no treatment I know of that is capable of rapidly absorbing the inflammatory manifestations and which removes them permanently." Despite these statements the author advises the use of "A solution containing ephedrine (alkaloid), sodium bicarbonate and sodium chloride, 8 grains of each (0.518 Gm.) to 1 ounce (29.5 cc.) of distilled water." One drachm (3.69 cc.) of this solution is mixed with an equal amount of hot water and sprayed freely and frequently into the nose. He also advises scarification at the uncinate and the lower border of the middle turbinate to relieve congestion and pressure about the ostium. The tissues are allowed to bleed for ten minutes. This is followed by the application of a 20 per cent solution of silver nitrate.

Moore [227] describes several cases in which the diagnosis was overlooked. In case 1 there were blindness, paresis of extra-ocular muscles and a history of several previous injuries. Ultimately, the antrums were found to be infected, and after several irrigations the entire process cleared up, including the ocular symptoms. In case 2 a severe infection of the antrum and the ethmoid sinuses caused external swelling. The only prodromal symptom was pain in the teeth. Case 3 was an instance of severe glossopharyngeal neuralgia, which was traced to an infected sphenoid sinus and relieved by irrigation. In case 4 the patient was a woman who complained of severe pains in the occiput and the back of the neck, with jerking of the head and upper extremities, nausea and vomiting. A sphenoid sinus in which infection was suspected was opened and found to contain foul cheesy pus.

An interesting report of 4 cases of primary hemorrhage from the antrum is given by Bass.[228] In the first case, that of a woman of 43, fresh blood could be seen coming from below the anterior end of the middle turbinate. Puncture and irrigation of the antrum also brought fresh blood. Repeated packing failed to stop the bleeding. Thromboplastin was injected into the antrum, and the hemorrhage ceased. The blood pressure was 130 systolic and 108 diastolic. The patient remained well for four years without any recurrence but died of a paralytic stroke. The second patient was a youth of 18, who had repeated hemorrhages and fresh blood on puncture and irrigation. In his case, however, polypi were seen in the middle meatus and the roentgenograms revealed clouding of the ethmoid sinus and antrum. A Caldwell-Luc operation was performed and revealed that the antrum was full of polypi. The third patient was a man of 52. Blood could be seen coming down over the posterior end of the inferior turbinate. The

227. Moore, T. W.: Some Sinus Conditions with Unique Symptoms, South. M. J. **29**:382 (April) 1936.

228. Bass, A. L.: Primary Hemorrhage from the Antrum Highmore, South. M. J. **29**:815 (Aug.) 1936.

blood pressure was 108 systolic and 75 diastolic. Roentgenograms showed a cloudy antrum and diseased upper teeth. The sinus was irrigated, and thromboplastin was injected. The abscessed teeth were removed. Recovery followed. The author believes that the diseased teeth were probably the cause of the bleeding. In the fourth case (a woman of 56) the injection of thromboplastin into the sinus failed to control the bleeding. A Caldwell-Luc operation was performed, and after clots and polypoid membrane were removed it was found that the bleeding came from an eroded vessel near the natural ostium.

Williams [229] found that 42.6 per cent of 211 patients (315 antrums) operated on by the intranasal window method "gave some form of headache as their chief complaint." Complete relief was obtained in 63 per cent. He discusses the many factors which may complicate the diagnosis of the origin of the headache. A carefully taken history and examination are important in the evaluation of different factors contributing to the headache. The author found a typical Sluder syndrome present in 31.5 per cent of his cases, confirming a statement by Herbert Tilley that the antrum is the cause of this syndrome more frequently than is generally supposed.

Mahoney's [230] observations are more or less in the nature of a review of factors in the transmission of nasal infection to the lower air passages.

Gunsett and his associates [231] report an interesting case of a woman of 50, who was referred for radiotherapy because of an alleged carcinoma of the maxilla. There was a history of a slowly developing swelling of the left upper jaw, which was not particularly painful. Roentgenograms showed a diffuse cloudiness involving the whole maxilla and extending downward to a definite limit below and upward to involve the orbit and the malar prominence. Biopsy was requested, since the picture was not conclusive of a carcinoma. Incision disclosed an extensive suppuration, with destruction of the upper and external wall of the sinus but no sign of neoplasm. Subsequent roentgenograms revealed suppuration of the orbit, and another operation uncovered an extensive suppuration extending from the maxilla into the frontal sinus, with destruction of the upper limit of the sinus exposing the meninges.

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229. Williams, C. B.: Antrums and Certain Persistent Headaches, Texas State J. Med. **32**:408 (Oct.) 1936.

230. Mahoney, P. L.: The Relationship of Maxillary Sinusitis to Infection in the Contiguous Sinuses, Middle Ear and Lower Respiratory Tract, South. M. J. **29**:999 (Oct.) 1936.

231. Gunsett; Sichel; Schneider, and Gassman: Suppuration du sinus maxillaire et de l'orbite. Un cas de suppuration du sinus maxillaire avec destruction étendu des parois du sinus simulant un cancer du maxillaire supérieur, Bull. et mém. Soc. de radiol. méd. de France **24**:170 (Feb.) 1936.

Strong [232] divides antral disease of dental origin into four types as follows: 1. That in which there is a symptom complex of vague headache, a sense of fulness and general malaise and in which the sinus condition is discovered only on routine examination for focal infection. 2. That in which there is involvement beginning with a toothache, which may disappear and is followed by dull throbbing or aching in the cheek, which is worse at night, a feeling of fulness and intermittent discharge. The author believes that this type is due to osteitis of the alveolus and the adjacent wall of the sinus. 3. Chronic involvement in which the toothache may have been long forgotten. Headache and neuralgia are relieved at times when the nose discharges. 4. The type in which there are aching and persistent catarrhal discharge, the pain being over the antrum and the frontal region. This and type 3 are often associated with a fistula from the alveolus into the antrum, which accounts for the constant reinfection of the latter. As for diagnosis, the author frequently finds tenderness and edema over the region of the infected or dead tooth. Transillumination has been fairly dependable (20 per cent of error) and roentgenograms very reliable (only 5 per cent of error). Irrigation of the sinus makes the diagnosis certain. According to the treatment, which must be directed toward the offending teeth as well as the sinus, the involvement falls into three types—(1) that in which extraction of a tooth had led to a fistula into the antrum, the treatment being to block the fistula with a vulcanite plate and to drain the sinus via the nose; (2) that in which the infection of the antrum is kept up by dental sepsis and in which the treatment for type 1 must be supplemented by frequent irrigations. Should this fail, the condition belongs to the last type, (3) in which the infection is kept up by alveolar necrosis. Disease of this type requires a Caldwell-Luc operation.

Cuthbert [233] discusses the various symptoms and diseases of the antrum which may be due to dental causes, such as granuloma from diseased teeth or following extraction, a tooth pushed into the antrum, fistula of the antrum following extraction or persistent drainage of pus from a tooth socket. He cites 2 cases of formation of a dental cyst. In 1 case the patient suffered from severe neuralgia for twelve months. An upper bicuspid was extracted, after which the antrum became tender to palpation. Roentgenograms showed a cyst, which was removed. At the operation another tooth was extracted, of which three roots had penetrated the floor of the antrum without rupturing the lining membrane. Drainage was effected through the nose, and the gingival wounds were completely closed.

232. Strong, C. N.: Some Considerations of the Pathology and Treatment of Dental Infection of the Antrum, Proc. Roy. Soc. Med. **29**:1547 (Oct.) 1936.

233. Cuthbert, N. M.: The Relationship Between Dental Infection and the Nasal Sinuses, M. J. Australia **1**:467 (April 4) 1936.

Federici [234] describes a rare case of a supernumerary upper molar which through inversion of the tooth germ was rotated 180 degrees from the normal position and had grown through the naso-antral wall into the posterior part of the inferior meatus. It was removed through the nose. The author claims that it is the only case of its kind on record.

Sutherland's results [235] from surgical intervention on the antrum in asthmatic persons have been disappointing. He checked up on 41 patients and found only 3 reporting permanently beneficial results. In more than half of his cases tests for allergy failed to demonstrate extrinsic factors as a cause for the polypoid degeneration of the mucosa. He sets considerable store by a statement of Alexander Francis that if a patient suffers from polypoid degeneration "operation is diastrous if he also happens to be hypersensitive to aspirin and has a low blood pressure." (This applies only to cases in which no sensitivity to allergens can be demonstrated.) The outlook in this type of case is bad, since surgical treatment affords no relief unless true infection is present. Slight benefit may be obtained from the use of nonspecific protein therapy. Persons proved allergic to definite extrinsic factors can be helped by careful desensitization. One must have sufficiently powerful reagents for the injections. The author believes that most emulsions of house dust are too weak.

Antognoli [236] observed myeloid leukemia in a man of 30, with symptoms of involvement of the antrum. A pale swelling the size of an orange appeared over the cheek. In the gingival recess there were pus and ulceration. A Caldwell-Luc operation was done, revealing extensive necrosis involving the cheek and the entire sinus from the palate to the roof and backward into the pterygomaxillary fossa. Roentgen treatment failed. Autopsy showed that the infiltration, which was typical of leukemia, extended as far back as the eustachian tube.

Frontal.—Rey and Lapeyre [237] report a case of a 26 year old soldier who became ill with severe headache which was relieved by 2 tablets of acetylsalicylic acid. The next day his temperature was 38.3 C. (100.5 F.) and later 37.5 C. (98.8 F.). The subjective symptoms were relieved, and the patient made no complaint. Two days later he was

234. Federici, F.: Un rarissimo caso di dente della saggezza soprannumerario cresciuto verso la fossa nasale, Arch. ital. di otol. **48**:461 (Aug.) 1936.

235. Sutherland, C.: Allergy and Antral Infections, M. J. Australia **2**:492 (Oct. 10) 1936.

236. Antognoli, G. C.: Leucemia mieloide con localizzazione al seno mascellare, Ann. di laring., otol. **36**:112, 1936.

237. Rey and Lapeyre, A.: La mort subite au cours des sinusites, Soc. de méd. mil. franç., Bull. mens. **30**:162 (May) 1936; Ann. de méd. lég. **16**:497 (Oct.) 1936.

found unconscious in bed, and he died half an hour later. Autopsy showed a gangrenous abscess covering the entire right hemisphere of the brain through the cortex. The white substance and the opposite half of the brain were uninvolved. The right frontal sinus, which was very large, was infected, and the posterior wall was necrotic. The author refers to similar cases reported by Mollison, Pirquet and Guilbert, Worms, and Fribourg-Blanc and points out that the symptoms of sinus involvement may be wholly lacking despite a most severe intracranial complication. Perhaps a more careful scrutiny of the sinuses in the presence of obscure acute cranial symptoms might reveal the original focus.

Layton [238] makes much of the details of the general care of patients with acute frontal sinusitis. He insists on rest in bed, thorough catharsis, quiet surroundings and a diet liberal in fluids, 300 ounces (8.8 liters) of which should be administered within the first twenty-four hours in severe cases. He advises against antipyretics, relying on acetylsalicylic acid and morphine if necessary for the relief of pain. He has abandoned the use of ephedrine and epinephrine because of their evanescent effects and prescribes instead a weak menthol oil spray. In addition he uses a light bath to the head alternating with inhalations of menthol.

Rawson [239] believes with Halphen that a low grade infection in one of the sinuses may act as an exciting agent on the autonomic nervous system and give rise to a train of typical angioneurotic symptoms. A case in point is cited, the patient having suffered for three years from recurring intensive frontal headaches accompanied by nausea and pallor. Examination revealed only slightly cloudy frontal sinuses. Treatment consisted of amputation of both middle turbinates and exenteration of the ethmoid cells, which were lined with hyperplastic mucosa. Relief was afforded immediately, and there was no recurrence.

Halbron [240] describes the nasociliary syndrome, Sluder's syndrome and vacuum headache, all of which are ascribed to irritation of the sympathetic nerve fibers. The spasmodic character of the attacks, the accompanying vasomotor phenomena and the intervals of freedom from symptoms all point to disturbances of the vasomotor nerves brought about by peripheral irritation. In frontal vacuum headache the dilatation of vessels in the mucosa due to blocking of the duct results in edema, which the author claims is of the angioneurotic type. Vasomotor

238. Layton, T. B.: The Treatment of Acute Frontal Sinusitis, Lancet **2**: 1345 (Dec. 14) 1935.

239. Rawson, R. D.: A propósito del edema agudo angioneurótico, Rev. oto-neuro-oftal. **11**:151 (June) 1936.

240. Halbron, P.: Contribution a l'étude de la pathogénie de certaines interréactions neuro-végétatives de l'oeil et du nez, Rev. d'oto-neuro-opht. **14**:468 (July-Aug.) 1936.

filaments accompanying the trigeminal fibers cause reflex pains. Nearly all these attacks can be relieved by cocainization. Operation frequently discloses the edematous state of the mucosa.

Eisen [241] describes a syndrome due to hyperostosis of the internal table of the frontal bone. His patient was a woman of 45 with symptoms of loss of weight, blindness, loss of hearing, unilateral anosmia, diabetes and neuropsychiatric changes, all coming on in one year. Roentgenograms revealed a wavy thickening of the internal plate of the frontal bone up to about 1 cm. Films taken one year later showed the bone to be increasing in thickness. The blood calcium was much reduced (6.3 mg.). Operation was suggested but was refused by the patient. The etiology of the condition was not known.

Bryant [242] relates the case history of a woman of 23, who had an abscess over one eye which was opened in 1930 and had continued draining ever since. Headaches and psychic disturbances appeared shortly before she was examined by the author. Operation revealed a sequestrum the size of a half-dollar and erosion of the posterior plate of the frontal sinus exposing thickened red pulsating dura. Recovery ensued.

Of a total of 26,511 patients seen by Vernaza,[243] 5 per cent had sinusitis, which was nonsuppurative in less than half the cases. The author found a large number suffering from typical periodic attacks of frontal headache coming on in the afternoon for four to twelve days as a result of congestion due to a cold or grip. Pain was increased on exertion or stooping, and there generally was an accompanying tenderness at the internal orbital angle, usually relieved at night. Recurrences were common in patients who had deviated septums, enlarged turbinates, prominent bullae or a nasopharyngeal infection. For therapy the author offers roentgen rays and diathermy in addition to removal of anatomic deviations.

Diggle [244] and Cawthorne [245] presented papers on acute frontal sinusitis before the Royal College of Surgeons on Dec. 6, 1935. The former divides the condition in his cases into the pyrexial, in which high fever and severe general symptoms are present, and the apyrexial, which is none the less acute. The latter is treated conservatively. If

241. Eisen, D.: The Internal Frontal Hyperostosis Syndrome, Canad. M. A. J. **35**:24 (July) 1936.

242. Bryant, B. L.: An Unusual Case of Frontal Sinusitis, J. Med. **17**:82 (April) 1936.

243. Vernaza, F.: La neuralgia de la freute por hiperemia o estado congestivo del seno frontal, Rev. méd. de Bogotá **45**:1 (May-June) 1935.

244. Diggle, F. H.: The Treatment of Acute Frontal Sinusitis, J. Laryng. & Otol. **51**:318 (May) 1936.

245. Cawthorne, T.: Treatment of Acute Frontal Sinusitis, J. Laryng. & Otol. **51**:322 (May) 1936.

shrinking and suction fail, he advises resection of the septum and removal of the middle turbinate. He suggests opening some ethmoid cells if they block drainage, but he is opposed to the use of the rasp. The patients with high fever require external drainage. The sinus mucosa is not touched, and the cavity is drained with rubber tissue. He advises applying phenol to the exposed raw edges of the bone to prevent osteomyelitis. In 40 per cent of his cases the condition was cured by conservative treatment. Cawthorne believes that in almost all cases frontal sinusitis is associated with infection of the ethmoid sinuses or the antrums. He is impressed with the need of draining the antrum but is against removing the middle turbinate. External drainage is indicated only if the infection has escaped into the tissues beyond the sinus. If the latter is indicated, the author favors the Howarth operation, although he also has a good word for the Ferris-Smith technic.

In the discussion following these papers Howarth states that 80 per cent of the patients with acute sinusitis get well under conservative treatment. If necessary, he passes a sound through the duct into the frontal sinus, crushing the middle turbinate out of the way. Ridout also favors conservative treatment. Kisch states that the records of the London Eye and Ear Hospital show that the conservative policy followed was most successful. He also claims that lavage of the antrum is important. Persons with external swelling are also treated conservatively unless it is necessary to drain an abscess. The author claims beneficial results from the use of small doses of roentgen rays. Layton is even more conservative and avoids lavage of the antrum as well as surgical operation on the middle turbinate unless signs of complications are present. Woodman does not agree with Layton despite the fact that 70 per cent of his patients get well on conservative treatment. He favors a small external opening for drainage. Troup likes radiotherapy, the infra-red lamp and short wave diathermy. Downer obtains much relief from the steam kettle. Negus contributes a suggestion that lavage of the antrum is useful because it clears the natural ostium and facilitates drainage from the frontal and ethmoid sinuses.

Ethmoid and Sphenoid Sinuses.—Kelly[246] presents a thorough discussion of the question of ethmoiditis. He believes that the "acute catarrhal type is a holdover from the old classification when the rhinologists dealt with an allergic condition and were not familiar with its etiology." In addition to the usual classification, the author adds vasomotor rhinitis and ozena, because at the Manhattan Eye and Ear Infirmary the physicians have found the ethmoid sinuses so frequently involved in these conditions. Improved hygienic and dietetic conditions

246. Kelly, J. D.: Operative and Non-Operative Treatment of Ethmoiditis, Ann. Otol., Rhin. & Laryng. **45**:1050 (Dec.) 1936.

in recent years have led to a marked decrease in the incidence of ozena. Allergy demands a study of exhaustion neuroses, endocrine imbalance and general anaphylaxis to various toxins. The author is opposed to ionization, since it treats only the effects and not the causes. For acute suppurative ethmoiditis he opposes dry suction because of the undetermined amount of trauma it causes to the mucosa. It also causes a partial vacuum in the sphenoid and frontal sinuses, with the danger of aspiration of infected material into them. Suction irrigation is also decried. It often aggravates the condition, because the irrigating solution is often the "vehicle for the transfer of infection to all the sinuses: suction irrigation may readily change a mild infection to an overwhelming one." In hypertrophic and purulent infection the author has had some good results with Krueger's vaccine. The former is the type of ethmoiditis that often causes inflammatory conditions affecting the eye. In most cases the author prefers intranasal procedures combining the technic of Mosher and that of Faulkner. Chronic purulent sinusitis and that associated with asthma and bronchiectasis may require radical operation. Not having had much success with desensitization or endocrine therapy, he advises intranasal surgical operation if the roentgenograms show more osteoporosis than osteosclerosis and only moderate hyperplasia with moderate secretion. Otherwise, one must resort to radical intervention in which case he advises a two stage procedure—double external ethmoidectomy according to the method of Lynch or Smith followed in from ten days to two weeks by a bilateral Caldwall-Luc operation. In the latter operation he suggests removing hyperplastic portions of the inferior turbinate, since they may interfere with drainage from the antrum and prevent recovery.

Mihaileanu and Graur [247] report a case of aleukemic lymphadenosis which in its course showed various complications, such as thrombophlebitis, gastro-intestinal disturbances, optic displacement and meningitis. Hyperplasia of lymphatic cells occurred in numerous regions, consisting of lymphoblasts and prolymphocytes. The frontal, ethmoid and sphenoid sinuses were found at autopsy to be filled with pale polypoid rose-violet material, which caused pressure on the orbit and had invaded the meninges causing terminal meningitis.

Jay's patient,[248] a woman of 62, gave a history of pain over the antrums for two weeks with free discharge of pus both anteriorly and postnasally. Bilateral paresis of the abducens nerve developed, with swelling in front of the right ear. The pain was only moderate. The

247. Mihaileanu, G., and Graur, I.: Aleukemic Lymphadenosis with Thrombophlebitis and Involvement of the Gastro-Intestinal Tract and Fronto-Ethmoid Sinuses, Cluj. med. **17**:165 (March 1) 1936.

248. Jay, H. M.: Unusual Complications of Sphenoiditis, Australian & New Zealand J. Surg. **5**:397 (April) 1936.

fundi showed tortuous veins. The ears were normal. The swelling of the face extended to the angle of the orbit and the zygomatic and temporal regions. The temperature was 102.6 F. The patient was given 30 cc. of antistreptococcus serum. Roentgenograms showed the antrums and sphenoid sinuses to be dark. After the opening of these sinuses the temperature dropped from 104 to 98 F., but later it fluctuated between 99.6 and 103.6 F. In three days the swelling and diplopia disappeared. The patient died of pneumonia. There were no signs of thrombosis of the cavernous sinus at any time. Permission for autopsy was refused. The author claims that he could find only one case like his reported in the literature. Hajek cites Scholz' case, in which pus eroded through the body of the sphenoid bone into the soft tissues in a manner similar to that in his (Hajek's) case. However, in Scholz' case the cavernous sinus was involved. Hajek also quotes Eagleton on the subject of extension of infection from the sphenoid sinus.

Bowers [249] comments on the relationship of the sphenoid sinus to various important structures and the possibility of symptoms being referred from it to other organs. He cites the history of a woman suffering from pain in the ear, impaired hearing and vertex headaches. A throbbing pain over the vertex was increased on stooping. There was a daily rise of temperature to 99 or 100 F. The duration of the symptoms was sixteen months. There was a history of influenza three years previously. General examination gave no clues, and treatment of the ears yielded no results. Local examination showed only a slight postnasal discharge. Roentgenograms revealed some fuzziness in the sphenoid area. Probing and washing the sphenoid sinuses caused severe pain in the ears. Both sphenoid sinuses were opened, and their lining membranes were found to be polypoid. General improvement followed, and within two months the hearing was completely restored.

MISCELLANEOUS

Mounier-Kuhn [250] reports two interesting cases of sinusitis in which recurring attacks of vertigo were a prominent symptom. The first patient, a woman of 32, complained of a sensation of falling, which was so bad that she was forced to sit or lie down most of the time and acquired a definite agoraphobia. Removal of a premolar tooth revealed a cystic cavity communicating with the antrum. Relief was obtained only after removal of the middle turbinate and curettement of a polypoid ethmoid labyrinth. The second patient had an infection of the

249. Bowers, C. H.: Unique Symptoms and Effects of Sphenoidal Disorders, Surg., Gynec. & Obst. **62**:514 (Feb.) 1936.

250. Mounier-Kuhn, P.: Contribution aux vertiges au cours des sinusites; une hypothèse en accord avec la théorie de Quix, Ann. d'oto-laryng., April 1936, p. 374.

maxillary and ethmoid sinuses after the use of a pack to control a nasal hemorrhage. The patient complained of a sensation of being pulled backward together with vertigo and a feeling of being in a void. This feeling was not noted when he was moving on a level or ascending but was marked when he was descending. On lying down he had the impression of being pulled backward or of falling backward. The vertigo was definitely in the sagittal plane and in a backward direction. Tests performed according to the method of Quix showed a positive reaction in position five (index fingers pointing downward). The lesion is supposed to be in the macula utriculi. In the second case, in which the lesion was in the posterior sinuses, the author believes that the excitation of the macular end-organs was due to a reflex arc operating from the vasomotor disturbance in the sinus mucosa. Jacod distinguishes between anterior vertigo due to disease of the anterior sinuses and posterior vertigo due to disease of the posterior sinuses. He believes with Quix that the maculae are susceptible to impulses either forward or backward. Much space is devoted to a discussion of the merits of Quix' theory of postural reflexes.

Claus [251] finds that syphilis of the sinuses is usually of the tertiary type. When it affects the maxillary sinus, it is not as dangerous as when it involves the other sinuses. In the frontal sinus the site of predilection of the gumma is the anterior wall. The diagnosis is easy when there is involvement of bone without infection of the lining membrane.

Leite [252] reports a case in which a bullet entered the outer part of the eyelid and penetrated into the sphenoid sinus directly under the sella turcica. The bulb was destroyed, and there was temporary paralysis of the legs, which was attributed to hemorrhage in the medullary sheath. The foreign body had been present for five years at the time of writing without any further symptoms. The author was able to find only 8 similar cases reported in the literature up to 1935.

On the basis of previous investigations supported by reports from other sources as well as follow-up of patients Cullom [253] finds that 85 per cent of the purulent infections of the middle ear and the mastoid are due to chronic sinusitis on the same side. In 91 per cent of the cases of scarlet fever in which infection of the ear develops, sinusitis is present on the same side. He believes that sinuses infected in the course of contagious diseases remain chronically or latently infected and that

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251. Claus, H.: Syphilis der Nase und Nebenhöhlen, Ztschr. f. ärtzl. Fortbild. **33**:541 (Oct. 1) 1936.

252. Leite, A. O.: Ein seltener Fall von Fremdkörper (Revolverkugel) im linken Sinus sphenoidalis, Arq. clin. oftal. e otol. **2**:108, 1935.

253. Cullom, M. M.: The Chronicity of Sinus Disease and Its Relation to Middle Ear Infection, Deafness and Constitutional Disease, Tr. Sect. Laryng., Otol. & Rhin., A. M. A., 1936, p. 84.

subsequent acute attacks are merely exacerbations. The infected sinuses cause infection of the ear, because of the natural drainage backward directly involving the adenoids and pharyngeal tissues as well as the eustachian tube. Prophylaxis consists of weeding out carriers and susceptible persons and of early serum treatment of scarlet fever and careful examination and treatment of sinuses suspected of being involved.

Zanzucchi [254] describes a case of extensive tuberculosis involving the septum, both turbinates, the antrum and the ethmoid sinuses on one side. He claims that it was osteoperiostitis and specific osteochondritis with formation of tuberculous granulations and with little tendency to the formation of connective tissue. The condition corresponds to tuberculosis of the bone elsewhere and is rarely seen about the bones of the face. This type was first described by Koschier in 1895, and has since been elaborated by other authors. Most authors agree that the infection is hematogenous and secondary to pulmonary tuberculosis. It occurs most often in girls during the second decade.

Podestá [255] discusses sinusitis of allergic origin and covers familiar ground.

McCready [256] states that in some cases vasomotor rhinitis may be self induced, and cites instances in which the prolonged use of ephedrine led to a state of persistent nasal block, discomfort and general malaise. The repeated use of diathermy and ionization may also lead to permanent atrophic changes. He advises removing polypi, even though the nasal discharge is of an allergic nature. In most cases the condition is associated with sinus diseases requiring surgical treatment. He claims to have observed a few hundred cases of asthma in twenty-five years, in 85 per cent of which he could demonstrate sinus disease. In such cases, he insists, the disease must be dealt with through radical surgical operation.

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254. Zanzucchi, G.: Di un caso di tuberculosi nasale osteocartilaginea associata a manifestazioni specifiche delle cavità accessorie, Arch. ital. di otol. **48**:260, 1936.

255. Podestá, R.: La inflamación hiperérgica en las rinitis y sinusites alérgicas, Rev. Asoc. méd. argent. **49**:1540 (Oct.) 1935.

256. McCready, J. H.: Status of the Allergic Nose in Sinusitis, Hay Fever and Asthma, West Virginia M. J. **32**:404 (Sept.) 1936.

News and Comment

ACADEMY OF PHYSICAL MEDICINE

The fifteenth annual meeting of the Academy of Physical Medicine will be held at the Hotel Walton, Philadelphia, Oct. 19-21, 1937. The academy, which is international in scope, will present a scientific program based on reports of the most recent research and practice of the various specialties. In addition to the lectures, demonstration clinics will be held at the Hospital of the University of Pennsylvania, the Jefferson Medical College Hospital and the Temple University Hospital. A copy of the program may be had from the chairman of the committee on program and publication, Dr. William D. McFee, 41 Bay State Road, Boston.

AMERICAN LARYNGOLOGICAL ASSOCIATION CASSELBERRY PRIZE FUND

A sum of $500 that has accrued from the Casselberry Fund for encouraging advancement in the art and science of laryngology and rhinology is now available, in part or as a whole, for a prize award, a decoration or the expense of original investigation or research in the aforementioned domains. Theses or reports of work must be in the hands of the secretary, Dr. James A. Babbitt, 1912 Spruce Street, Philadelphia, before February 1 of any given year.

Abstracts from Current Literature

Ear

THE PROGNOSIS OF MODERATE DEAFNESS IN YOUTH: VARIATIONS WITH DISEASE, MANAGEMENT AND TREATMENT. E. P. FOWLER, New York State J. Med. **36**:607 (April 15) 1936.

A study of thousands of audiograms over a period of years shows that while clinical treatment and management are often not satisfactory, much can be done to prevent deafness in children.

AIKMAN, Rochester, N. Y. [AM. J. DIS. CHILD.]

CHRONIC SUPPURATIVE OTITIS MEDIA. M. R. SHERIDAN, Brit. M. J. **1**:791 (April 18) 1936.

Sheridan outlines his observations, based on careful investigation. In most of the patients chronic otitis media was the result of involvement of the mastoid. He thinks the radical operation should be performed rather than any representing a compromise, unless the tympanic membrane can be left practically intact or in a position to heal.

ROYSTER, University, Va. [AM. J. DIS. CHILD.]

IMPORTANCE OF OTOMICROSCOPY IN THE DIAGNOSIS AND TREATMENT OF THE SO-CALLED SECRETORY MIDDLE-EAR CATARRH. E. LÜSCHER, J. Laryng. & Otol. **51**:454 (July) 1936.

Lüscher shows that the diagnosis of secretory catarrh of the middle ear is based on the demonstration of a fluid discharge in the tympanum. This demonstration is considerably simplified by investigation with the aural microscope, with a magnification of 10 diameters or more, because the limits of the discharge in the tympanum appear unmistakably and with great clarity, even the smallest quantities of fluid being visible. Otomicroscopy permits the recognition of the following five forms of discharge in the tympanum, according to the amount of the fluid and air mixture: (1) hanging drop behind the umbo, (2) irregular lines of fluid resulting from capillary forces, (3) classic surface lines, (4) liquid froth composed of air bubbles and (5) liquid drops with air fissures. Otomicroscopy, therefore, offers an important practical aid for the diagnosis and treatment of secretory catarrh of the middle ear.

EDITOR'S ABSTRACT.

AUDIOMETRIC EXAMINATION OF PATIENTS WITH VERBAL AUDITORY HALLUCINATIONS. FERDINAND MOREL, Ann. méd.-psychol. **94**:520 (April) 1936.

Morel reports the results of audiometric examination of thirty-one patients, most of whom had had chronic auditory hallucinosis for from a few months to several years; others had dementia praecox and subacute alcoholic psychosis with verbal hallucinations. He found that in cases of chronic hallucinosis, even of long standing, there occurs no change in the acuity of hearing and no auditory scotomas are observed. So long as the external or the internal ear is not diseased, the audiograms of patients taken when they are not hallucinating do not differ from those of normal persons. On the other hand, disease of the ear affecting the acuity of hearing does not alter the character or content of verbal auditory hallucinations. Audiograms taken at the time when patients had auditory verbal hallucinations (hearing of "voices") revealed several interesting abnormalities. First, there occurred immediately a rise of the threshold of hearing, with resulting momentary cleavage between the normal threshold of the patient and the threshold

obtained at the time of the hallucinations. The duration of the phenomenon is a few fractions of a second; it may occur during the audiometric test as a series of paroxysmal elevations of the threshold of hearing. Morel compares the effect of the hallucination on auditory acuity to intermittent claudication of hearing. The momentary rise of the threshold of hearing coincident with auditory hallucinations is shown on the audiogram by an irregular "fringe" of threshold points above the curve for the normal threshold of hearing of the patient. The record of the latter for a given patient is always the same, while the "fringe" is extremely variable from one examination to another; the "fringe" may be present on one day and absent on another; it may appear at one time over the sector of low pitch (low frequency), and at another time it may shift and appear over the sector of high pitch (high frequency). It appears as though there occurs between the sound stimulus and the false perception a sort of contest in which the latter always wins and alone is listened to by the patient, without, however, total loss of objective hearing. Thus, one patient stated that when the sound of the audiometer and the "voices" occur simultaneously, "the voice is the stronger," "the voice is on top" (*la voix couvre*); another stated that "one cannot pay attention to both at the same time;" another claimed that "when voices come at the same time as the musical sound" he gave "preference to the voices." In this patient the difference between the normal threshold of hearing and the "fringe" was at times as great as 45 decibels. When patients were requested to compare the "voices" with the audiometric sounds of varying pitch and intensity, they were not able to do so. In this feature the auditory hallucinations differ from the so-called "entotic sounds" (subjective whistling, ringing and humming sounds of otogenic origin). The latest-mentioned "sounds" often were identified by the patients with the audiometric sounds of definite pitch and intensity. Furthermore, the auditory hallucinations were never associated with lowering of the threshold of hearing, i. e., with an increase of auditory acuity, while the "entotic sounds" often were. Morel cites the case of a patient who, besides verbal hallucinations, had rhythmic "entotic sounds" (something like a short whistle) occurring at regular intervals. The audiogram of this patient showed, besides the usual "fringe" of hallucinatory threshold superimposed on the normal threshold of hearing, threshold points below that of her normal hearing acuity coincident with "entotic sounds." This shows that the mechanisms of verbal auditory hallucinations and of the "entotic sounds" are different. The verbal hallucination is an essentially negative phenomenon, a hole or temporary anesthesia in the elementary hearing. It may be regarded as a temporary impediment of auditory function occurring during the perception of elementary periodic sound. However, this impediment in the function of elementary hearing is probably only one aspect of the impediment of more elaborate auditory functions, such as hearing and comprehension of spoken words. Morel has observed that a verbal hallucination may be associated with momentary word deafness and that in some instances the patients were momentarily unable to recognize and identify familiar sounds. In other words, in these instances there was not only word deafness but actual cortical deafness—auditory agnosia. The abstract does not cover all the important points of this article.

YAKOVLEV, Waltham, Mass. [ARCH. NEUROL. & PSYCHIAT.]

RÔLE OF MASTOIDITIS IN INFANT PEDIATRICS. E. VON GYÖRGY, Arch. f. Kinderh. **108**:13 (April 28) 1936.

A series of cases in which grip, enteritis and dysentery were complicated by mastoiditis demonstrates that mastoiditis as a complication can produce a severe toxic form of the primary disease. Often improvement in the toxicosis can be expected after drainage of the mastoid. The indication for operation depends on exclusion of other factors by thorough clinical examination, since local evidence of mastoid infection may be slight. There must be no delay, since only by operating at the proper time can good results be obtained.

CRANE, Chicago. [AM. J. DIS. CHILD.]

CONGENITAL ABNORMALITIES OF THE EXTERNAL AUDITORY MEATUS: SQUAMOUS CELL EPITHELIAL CYST ON THE TYMPANIC MEMBRANE. H. WULLSTEIN, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **141**:150, 1936.

Wullstein describes the clinical and histologic aspects of a cyst the size of a pea, which was covered externally and internally with several layers of squamous cell epithelium and which was located where Shrapnell's membrane passes into the anterior upper wall of the auditory meatus. From the location of the cyst and from its internal and external lining with squamous cell epithelium, it can be deduced that it was a congenital deformity of the external auditory meatus. The deformity did not cause difficulties until secondary inflammatory manifestations developed. These led to the clinical examination and observation of the cyst. In the differential diagnosis consideration had been given to the possibility of cerebral tumor, cerebral hernia and cholesteatoma with labyrinthine fistula until the histologic examination clarified the problem.

EDITOR'S ABSTRACT.

THE QUANTITATIVE CALORIC TEST IN NORMAL PERSONS BY FILLING THE AUDITORY CANAL WITH WATER. ELISABETH HOPMANN, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **141**:155, 1936.

Hopmann describes caloric tests on two normal persons. The caloric stimulus was applied by a new method, namely, by filling the auditory meatus with water of a temperature of 27 C. The nystagmus jerks were registered on an apparatus, so that subsequent analysis would be possible. In addition to the duration of the nystagmus and the number of jerks, the frequency as well as the number of jerks in the first twenty, forty or eighty seconds was determined. Compared with the results of similar caloric tests, which are on record, the numerical values obtained as regards the duration of the nystagmus are somewhat more constant, but the differences between earlier and later and between right and left in the same person remain so large that the filling of the auditory meatus, just like the other test methods, is unsatisfactory as a quantitative method. To be sure, compared with other methods it has the practical advantage of simplicity. It can be performed without special devices, merely with a water glass and a teaspoon.

EDITOR'S ABSTRACT.

INCIDENCE OF CHRONIC OTITIS MEDIA. J. MELLER and H. MELLER, Monatschr. f. Ohrenh. **70**:436 (April) 1936.

J. Meller and H. Meller show that the examination of the native smear, Löwenstein's method for the culture of tubercle bacilli and the animal experiment are best for the demonstration of the tuberculous character of chronic suppuration of the middle ear. In 22.3 per cent of unselected ambulatory patients they detected tuberculosis of the middle ear. In two thirds of the cases the diagnosis was based on the results of culture and in one third on the examination of the smear. To be sure, the latter method alone is not entirely reliable. Three cultures, made at intervals of several days, are usually adequate for a reliable diagnosis of tuberculosis of the middle ear. Of nineteen persons with tuberculosis of the middle ear, seven showed an entirely normal pulmonary aspect, eight showed old, cured processes and only two showed manifest tuberculosis of the lung. Thus, tuberculosis of the middle ear is frequently the only tuberculous focus in the body. In the majority of cases otoscopy reveals total destruction of the tympanic membrane or central perforation. With the exception of the far advanced cases, the picture of chronic tuberculous inflammation of the middle ear is hardly at all differentiable from the nonspecific chronic form. Continued observation of one patient revealed that the elimination of tubercle bacilli is subject to considerable fluctuation in spite of improvement in the lesion of the tympanic membrane. The authors conclude that their studies demonstrate that tuberculosis plays an important rôle in the chronicity of otitis media.

EDITOR'S ABSTRACT.

OTOLOGIC SYMPTOMS IN CASE OF FRACTURE OF THE BASE OF THE SKULL. A. I. KOLOMIJČENKO, Monatschr. f. Ohrenh. **70**:513 (May) 1936.

Kolomijčenko emphasizes that patients with fracture of the base of the skull should be placed under the observation of an otologist as soon as involvement of the ear has been ascertained. If cerebrospinal fluid escapes, he considers a prophylactic operation advisable, for the outflow of cerebrospinal fluid is always a serious sign and only general considerations contraindicate surgical intervention in these cases. Otherwise surgical intervention is indicated (1) in case of symptoms of a complicating infection of the bones of the middle ear, even in the absence of the classic signs of mastoiditis, and (2) in cases in which otitis had existed before.

EDITOR'S ABSTRACT.

SOUND FEELING IN DEAF-MUTES AND ITS PRACTICAL SIGNIFICANCE. B. SCHINDLER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:431, 1936.

Schindler directs attention to the fact that in the determination and estimation of extremely small remnants of hearing, "hearing" and "feeling" are easily confused. He reproduces a curve that indicates thresholds of feeling in the ears of deaf persons and a curve indicating the threshold for tickling and pain in the ears of persons with normal hearing and of deaf persons. Further, he suggests methods which will enable every examiner to determine with his apparatus the intensity of feeling in deaf persons, which is extremely important for the differentiation of hearing and feeling.

EDITOR'S ABSTRACT.

Pharynx

THE NASOPHARYNX AS A PRIMARY SITE OF LYMPHOGRANULOMATOSIS. J. BERENDES, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **141**:141, 1936.

Berendes says that whereas formerly lymphogranulomatosis was regarded as a generalized disorder of the lymphadenoid apparatus, a disorder of the reticuloendothelium or an aleukemic systematic disorder, today an infectious pathogenesis is generally assumed. Although an infectious agent has not been identified, the histologic aspects of the lymph nodes during the various stages of the disease and the progression from one group of lymph nodes to the others are considered as indicative of an infectious nature. In the majority of cases the disorder begins with a noticeable swelling of the lateral cervical lymph nodes and later the lymph nodes of other regions become involved, through connection by way of lymph passages.

The author thinks that the cause of the development of the swelling in the cervical lymph nodes, that is, the portal of entry, has not been subjected to adequate anatomic investigations, for otherwise the nasopharynx, as the site of origin of the lymph passages in question, would have been more often subjected to careful inspection. After mentioning the isolated attempts in this direction, he emphasizes the necessity of cooperation between internists and otorhinolaryngologists so as to be able to determine how often in case of lymphogranulomatosis of the cervical lymph nodes the same disorder is demonstrable in the nasopharynx or in the upper air passages. He thinks that definite conclusions can be arrived at only on the basis of a large material. He presents the histories of two cases, in both of which there existed a lymphogranulomatous tumor in the nasopharynx. However, he admits that it would be wrong to look for the portal of entry of lymphogranulomatosis only in the epipharynx or in the upper air passages, the more so since the swelling of the lymph nodes does not always begin in the neck. But even in cases in which the swelling does first appear in the cervical lymph nodes, careful inspection of the epipharynx may fail to reveal anything, for it must be remembered that it is not necessary for permanent changes to develop at the site of the first lesion.

EDITOR'S ABSTRACT.

INITIAL STAGE OF LYMPHOGRANULOMATOSIS WITH PRIMARY LOCALIZATION IN THE PALATINE TONSIL. H. WULLSTEIN, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **141**:146, 1936.

Wullstein reports a case in which a primary complex of lymphogranulomatosis was histologically demonstrated in the region of the left tonsil and its regional lymph nodes on the neck, while the other parts of the organism and the blood picture were still normal and there was as yet no increase in temperature. The local manifestations on the tonsil and the lymph nodes were removed by extensive surgical intervention, and the operation was followed by roentgen irradiation. At the time of writing a year had passed without recurrence or generalization of the disorder. Although it is not certain whether generalization will be prevented, the case proves that surgical intervention does not hasten a generalization of lymphogranulomatosis.

EDITOR'S ABSTRACT.

TONSILLECTOMY IN THE THERAPY OF QUINCKE'S EDEMA. H. WULLSTEIN, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **141**:232, 1936.

Wullstein describes a case of Quincke's edema with involvement of the pharyngeal mucous membrane, in which the swellings appeared the first time and also later several times in connection with angina. Because of this concurrence with angina, treatment by tonsillectomy seemed justified. As a result of the tonsillectomy, there developed extensive swelling and necrosis in the region of the wounds, which later spread to the nasopharynx and the left side of the nose. There was considerable loss of tissue in the pharynx (uvula and the left palatine arches), and this resulted in rhinolalia aperta and a mild degree of deafness in the middle ear on the left side. In addition to the local lesion, there were general symptoms, namely, swelling and redness over all the large joints and leukopenia. Blood transfusion proved effective against these as well as against the destructive processes in the pharynx.

EDITOR'S ABSTRACT.

BISMUTH IN THE THERAPY OF NONSPECIFIC ACUTE ANGINA. A. MONTEIRO, V. BRASIL FILHO and G. SAMPAIO, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:101, 1935.

Monteiro and his associates, after calling attention to former reports about their experiences with injections of preparations of bismuth in cases of nonspecific acute angina, describe studies on the mode of action of bismuth therapy. They reach the conclusion that whereas angina usually lasts a week bismuth therapy reduces it to from twenty-four to forty-eight hours. Since one, or at the most two, injections of bismuth cannot be harmful, the authors suggest that such an injection be given even if the diagnosis as acute angina is not quite clear. At the same time a specimen is taken for bacteriologic examination. After twenty-four hours either the improvement of the patient or the result of the bacteriologic examination will indicate whether the condition in question is angina or diphtheria.

EDITOR'S ABSTRACT.

Miscellaneous

INTRACRANIAL PRESSURE IN HEAD INJURIES. ARTHUR A. ZIEROLD, Arch. Surg. **31**:823 (Nov.) 1935.

On the basis of readings of pressure obtained by lumbar puncture in a series of 128 cases of injury to the head, the following conclusions are reached: In cases of severe injury to the head the abnormal intracranial pressure is not frequent, and only in a small percentage of cases will it exceed 300 mm. of mercury. Abnormal intracranial pressure is not frequent in fatal cases, nor is it a frequent

cause of death. Unconsciousness is not in itself evidence of abnormal intracranial pressure, nor is the period of unconsciousness a measure of the degree of intracranial pressure. Unless abnormal intracranial pressure develops rapidly and is of sufficient degree to approximate the blood pressure, changes in pulse rate and blood pressure do not develop, and such changes cannot be considered as satisfactory evidence of abnormal intracranial pressure. Neurologic findings, such as changes in pupillary reflexes and changes in reflexes elsewhere, are not signs of increasing intracranial pressure. Increased intracranial pressure is almost invariably attended by blood in the spinal fluid. When abnormal intracranial pressure occurs, it is the result of hemorrhage—extradural, subdural or within the substance of the brain. It is not probable that abnormal intracranial pressure of a degree sufficient to endanger life is susceptible to treatment by spinal drainage or by the use of hypertonic solutions. It also appears reasonable that such few abnormal intracranial pressures as occur which are of sufficient degree to endanger life are best treated surgically.

GRANT, Philadelphia. [ARCH. NEUROL. & PSYCHIAT.]

TREATMENT OF SCARLET FEVER AND DIPHTHERIA. C. WESSELHOEFT, M. Clin. North America **19**:1389 (March) 1936.

The treatment of scarlet fever resolves itself primarily into a consideration of serum therapy. When serum is used early in the disease, the toxic symptoms usually rapidly disappear. The frequent occurrence of serum sickness and the occasional development of the Arthus reaction render the routine use of serum of doubtful advantage. The use of convalescent serum, when obtainable, in severe toxic scarlet fever is growing in favor. Serum therapy has no appreciable effect on complications after these have appeared. Its value as a measure prophylactic against complications is in dispute.

The prevalence of a malignant type of diphtheria in Europe has excited interest in this disease anew and has led many observers to doubt the value of antitoxin therapy. This position, however, does not seem to be well taken when it is recalled that serum therapy in diphtheria is essentially protective. It does not dissolve the diphtheritic membrane or destroy the bacilli. It does neutralize the toxin. In the malignant form of the disease, some as yet unknown factor lowers individual resistance to a virulent strain of organisms endowed with increased penetrating and increased toxin-forming properties. Against this form antitoxin is ineffective because it cannot protect against the overwhelming infection; reliance can be placed only on the earliest possible use of serum and repetition of the injection, with moderate dosage, at frequent intervals.

EUGENE SMITH, Ogden, Utah. [AM. J. DIS. CHILD.]

FOREIGN BODY IN A BRONCHUS SPONTANEOUSLY EXPELLED THROUGH AN INTERCOSTAL SPACE. FERRU and DUCOS, Bull. Soc. de pédiat. de Paris **34**:177 (March) 1936.

A boy 8 months old was seized with a choking spell while seated in a garden in the afternoon. When examined that night, he had dyspnea, cyanosis and high fever but no positive physical findings in the chest. Fifteen days later an inflammatory swelling which had been present for a few days over the eighth right intercostal space opened, and the stalk of a barbed weed was expelled along with a few drops of serous fluid. There were a small area of dulness and distant blowing breathing under the swelling in the soft tissues. It is pointed out that spontaneous expulsion of a weed of this type through an intercostal space, though rare, has been reported by a number of observers previously and that it invariably has occurred on the right side.

BENJAMIN, Montreal, Canada. [AM. J. DIS. CHILD.]

CHRONIC MULTILOCULAR ABSCESS OF THE LUNG IN A CHILD. FERRU, DUCELLIER and SAVIN, Bull. Soc. de pédiat. de Paris **34**:180 (March) 1936.

A boy 11 years old had a large multilocular abscess in the upper lobe of the left lung. It seemed to have developed insidiously. Bronchoscopic aspiration was performed, and a large quantity of pus was withdrawn, from which streptococci grew on culture. Two years later a large cavity containing a small amount of fluid was still present despite vaccine and other therapy. His general condition remained good.

BENJAMIN, Montreal, Canada. [AM. J. DIS. CHILD.]

A CASE OF PERICRANIAL SINUS. M. FÈVRE, Bull. Soc. de pédiat. de Paris **34**: 190 (March) 1936.

A boy 10 years old had a fluctuating, pulsating round flat swelling in the left frontal region. It was noticed first when he was 7 years old. The fluid could be expressed. The first recorded instance of a condition such as this was that described as pericranial sinus by Stromeyer in 1850. The sac communicates with the longitudinal sinus, and its location is frontal or occipital. The operative treatment consists in extirpation of the sac and obliteration with wax of the opening in the skull, through which the connecting vein passes. This procedure was adopted in Fèvre's case, and two years later the boy was well and the condition had not recurred. The etiologic background is congenital, but trauma has also been mentioned as a contributing cause.

BENJAMIN, Montreal, Canada. [AM. J. DIS. CHILD.]

Book Reviews

Clinical Allergy. By Albert H. Rowe, M.S., M.D. Price, $8.50. Pp. 812. Philadelphia: Lea & Febiger, 1937.

This book is a successful attempt to present in one volume the present knowledge concerning the fundamental nature of allergic reactivity, the tissues most likely to be involved, the many recognizable causes and the available methods of diagnosis and treatment. It thus embraces the entire field of clinical allergy, and while it may occur to those familiar with the author's previous publication on food allergy that this volume is merely an elaboration of his former work, such is not the case. While special emphasis is placed on food allergy because he feels it has received delayed and insufficient recognition, he minimizes in no way the importance of inhalant, contact, injectant, bacterial or parasitic sensitization. As a reference work on food allergy, however, this section of the book is comprehensive, explicit and authoritative. The "elimination" diets, in the use of which the author was a pioneer, have been revised, and detailed menus for adults and children have been included in the appendix.

The various diagnostic procedures are detailed, with full consideration of ocular, inhalation and patch tests, the leukopenic index and diet trial. Of special value to the clinician is the presentation of the subject of gastro-intestinal allergy; symptomatology is considered from the point of view of differential diagnosis, and tables indicate the detailed analysis of symptoms in proved cases of gastro-intestinal allergy. It is thus feasible to deal separately with such items as canker sores, sore tongue, stomatitis, pharyngeal irritation, distention, belching, epigastric heaviness, pyrosis, nausea, vomiting and anorexia. This is followed by satisfactory discussions of pain in the upper right quadrant of the abdomen simulating disease of the gallbladder, the ulcer type of pain and allergy of the small intestine, constipation, cramping, diarrhea, appendical pain, colitis, mucous colitis, irritable colon, proctitis and pruritus ani. There is no overemphasis on the rôle of allergy but dispassionate consideration of the possibilities and presentation of actual cases which illustrate diagnostic and therapeutic problems. In dealing with allergic toxemia, fatigue and mental disturbances, it is pointed out that certain patients with the condition called intestinal toxemia a decade ago are really allergic and are relieved by the removal of allergic food from their intestinal tracts.

Bronchial asthma is discussed from all points of view, but especially in the light of recent clinical and laboratory investigation. A statistical study of 1,502 patients with bronchial asthma gives the results of skin testing and treatment. The all-important subject of diagnosis is exhaustively analyzed. The author feels that it is difficult to be certain about the actual amount of bronchial asthma arising from bacterial allergy, but from his clinical experience and the analysis of the literature (which he includes in his discussion) he inclines to the view that in only a small percentage of cases is bacterial allergy the fundamental cause of bronchial asthma. He observes that other results from infection than allergy to bacteria can produce asthmatic symptoms. The conclusions concerning surgical operation on the sinuses and the nose as a therapeutic aid in the control of asthma are extremely pessimistic. This continues to be a somewhat controversial subject. Most otorhinologists and allergists will agree that tonsillectomy is rarely, if ever, of benefit in bronchial asthma, but the majority continue to regard surgical intervention on the nose or sinuses as a necessary therapeutic step in a goodly number of cases after allergic investigation and treatment have been carried out for sufficiently long periods. In enumerating the secondary or non-specific influences on asthma, the author states that sinus and bronchial infections may change the allergic balance and thus set off the trigger mechanism of underlying allergy. This fact, as well as the frequency with which bronchial infections follow sinus infections, would indicate to the reviewer as thorough elimination of

sinus infection as possible—nonsurgical if effective, but surgical if necessary. The author's attitude on this question seems to be due to the orgy of unwarranted nasal operations on asthmatic persons in recent years, the unrestrained surgical attacks before proper study and treatment were instituted, the incomplete and poor procedures which obviously were doomed to fail of results and, finally, the continued advocacy of more and more radical surgical procedures, which in the majority of instances are not necessary.

As one of the most important causes of bronchial asthma, pollen allergy is discussed in the chapter on asthma, detailed attention being given to pollen counts and surveys, pollen units and standardization of pollen extracts.

In recognition of the recent advances in the knowledge concerning dermatoses, there is a chapter dealing with contact eczema, light eczema, rosacea, urticaria, prurigo mitis, angioneurotic edema and other allergic dermatoses. This chapter practically constitutes a complete review of the available literature and contains a critical survey of the accepted therapeutic measures.

The presentation of the salient facts concerning the differential diagnosis and symptomatology of migraine is precise and satisfying; the various therapeutic measures are handled fully and evaluated judiciously. It is gratifying to note that neuralgia of allergic origin is dismissed with appropriate brevity.

In concluding the chapter on nasal allergy, the author properly states that local measures are warranted provided such nasal symptoms are not controlled by adequate allergic diagnoses and therapy carried out over a prolonged period by a physician experienced in the field of allergy.

A perusal of the subject matter on urogenital allergy will be of much interest to those unfamiliar with the occurrence of allergic disease of the bladder and renal and ureteral pain due to allergy. Thorough consideration is given the relationship of allergy to arthritis, arthropathy, Henoch's purpura, transient paralysis, dysfunction of the nerves, epilepsy, psychic disturbances and Ménière's disease. Disturbances in childhood due to allergy are accorded a separate chapter of thirty pages. In response to the rapidly increasing interest in allergy as a cause of ocular symptoms, this subject is given special emphasis.

The extensive review of the literature in every division of discussion together with the alphabetically arranged bibliography greatly enhances the value of this book as a reference work. An index of authors and an index of allergens and excitants are also appended. The book will be read by every allergist, but it is of equal importance to the general practitioner and the specialist.

Directory of Otolaryngologic Societies *

FOREIGN

Collegium Oto-Rhino-Laryngologicum Amicitiæ Sacrum

President: Prof. Gunner Holmgren, Karolinska Mediko-Kirurgiska Institutet, Stockholm, Sweden.
Secretary: Prof. Dr. C. E. Benjamins, Verlengde Heereweg, 143 Groningen, Netherlands.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Gordon B. New, Mayo Clinic, Rochester, Minn.
Secretary: Dr. Leroy A. Schall, 270 Commonwealth Ave., Boston.
Place: San Francisco. Time: June 13-17, 1938.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Frank E. Burch, 408 Peter St., St. Paul.
Executive Secretary: Dr. William P. Wherry, 1500 Medical Arts Bldg., Omaha.
Place: Palmer House, Chicago. Time: Oct. 10-15, 1937.

American Bronchoscopic Society

President: Dr. Gordon Berry, 36 Pleasant St., Worcester, Mass.
Secretary: Dr. Lyman Richards, 319 Longwood Ave., Boston.
Place: Atlantic City, N. J.

American Laryngological Association

President: Dr. J. F. Barnhill, Miami Beach, Fla.
Secretary: Dr. James A. Babbitt, 1912 Spruce St., Philadelphia.
Place: Atlantic City, N. J.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Samuel J. Kopetzky, 51 W. 73d St., New York.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester, N. Y.
Place: Atlantic City, N. J.

SECTIONS:

Eastern.—Chairman: Dr. Louis H. Clerf, 1530 Locust St., Philadelphia.
Southern.—Chairman: Dr. Murdock S. Equen, Medical Arts Bldg., Atlanta, Ga.
Middle.—Chairman: Dr. J. B. Costen, 3720 Washington Blvd., St. Louis.
Western.—Chairman: Dr. Arthur C. Jones, 105 N. 8th St., Boise, Idaho.

American Otological Society

President: Dr. Harris P. Mosher, 828 Beacon St., Boston.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.